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A METAL CANOPY FOR BED HANGINGS.

BY J. WHITFIELD HARLAND.

MATERIALS — METAL PREFERABLE TO WOOD—THE DESIGN—WHERE TO OBTAIN THE PARTS READY MADE—HOW TO PUT THE FOUNDATION TOGETHER — HOW TO FIX THE STAMPED PLATES—HOW TO PROVIDE FOR FIXING TO THE WALL —COVERING THE "LAPS" OF THE PLATES AT THE ANGLES — KEEPING THE TUBES IN PLACE — THE VASES AND "DROPS"—CUTTING THE TUBES AWAY TO FIT FACE OF PLATES — GUTTA-PERCHA TEMPLATES — THE TWO END BAYS, AND HOW TO TREAT THEM—USE OF REPOUSSÉ WORK INSTEAD OF STAMPED WORK — CRESTING, CURTAIN-ROD, AND RINGS—VARYING THE COLOUR OF LACQUER—DRAPING.

ALMOST everyone is familiar with carved and gilt cornices for window curtains, and with the stamped brass imitations that have so much superseded them. The foundation of the window cornices, whether carved and gilt or stamped brass, is of wood, which in crowded cities and towns would not be advisable for bed canopies, as it would, especially from their comparatively inaccessible position, afford harbour for troublesome insects. It would therefore be far more cleanly, and sanitary also, to discard wood — which absorbs microbes in infectious illnesses — as a foundation, and construct the foundation entirely of iron. Wooden bedsteads have now almost disappeared, and metallic ones reign supreme. The bed canopy should naturally correspond and be of the same material, to be equally impregnable to vermin seeking refuge.

The perspective drawing (Fig. 1) shows an octagonal-shaped canopy made of stamped brass, lacquered and burnished, every part of which may be bought ready made from the furnishing ironmongers (those shown were purchased at A. Hawkins', London Road, S.E.), who usually keep several patterns in stock, and also have pattern-books showing hundreds of other

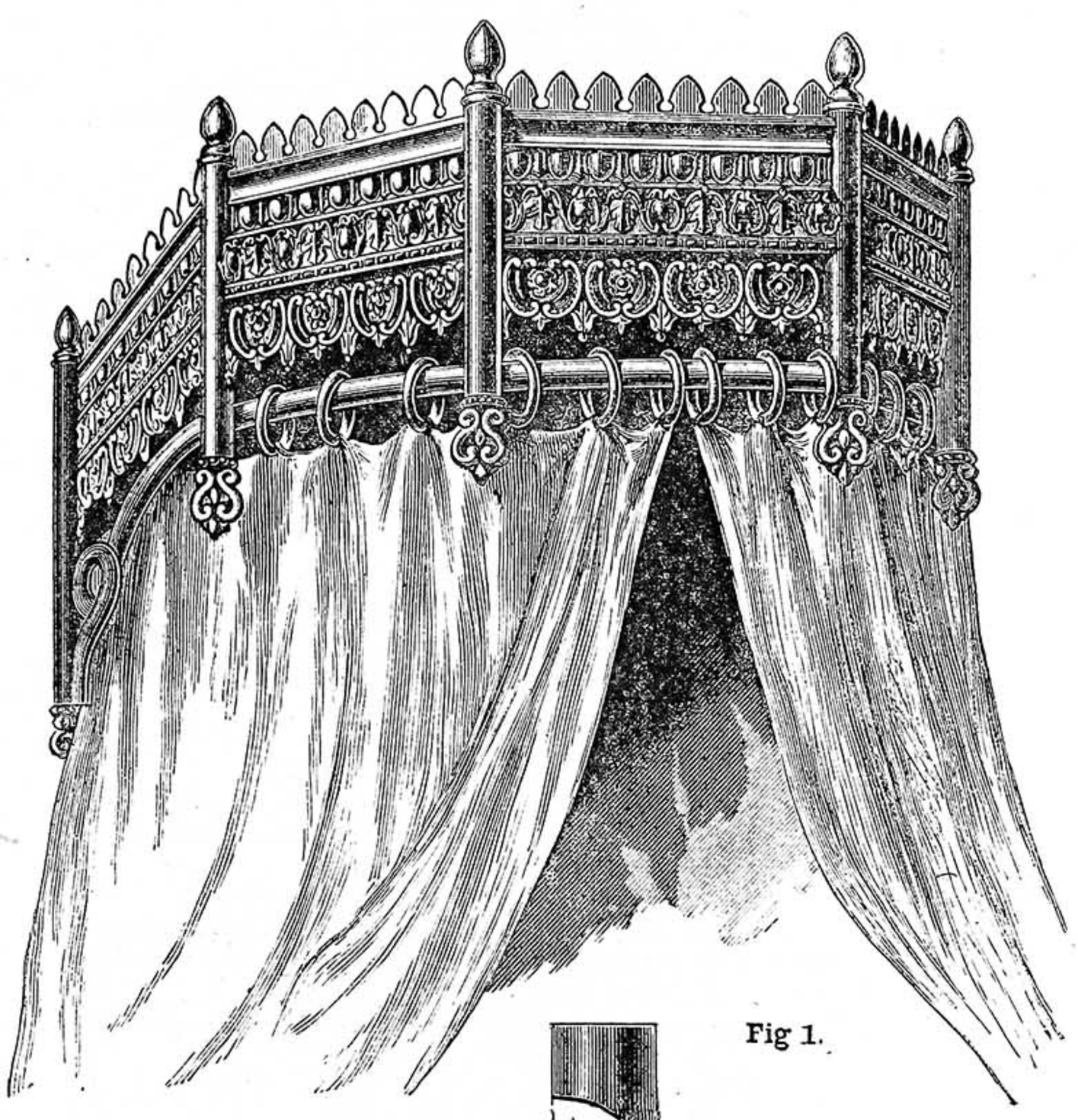


Fig 1.

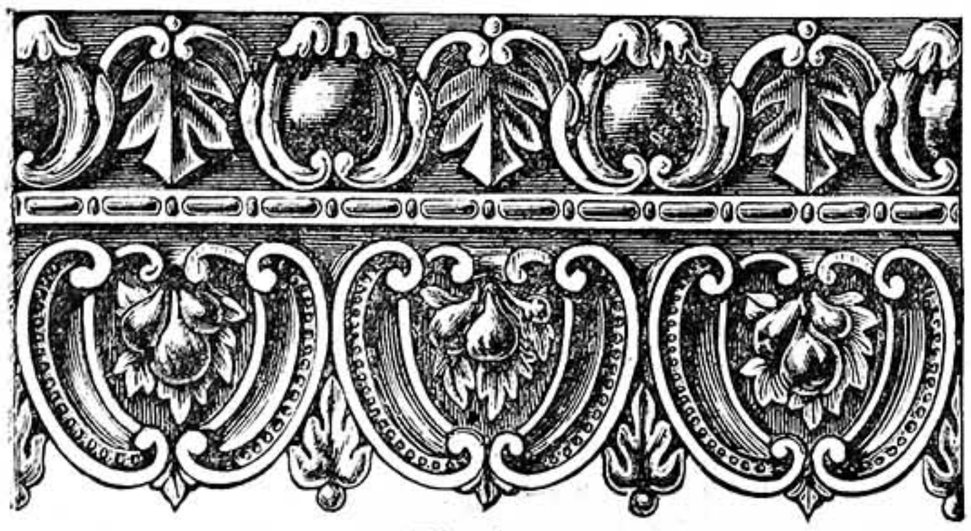
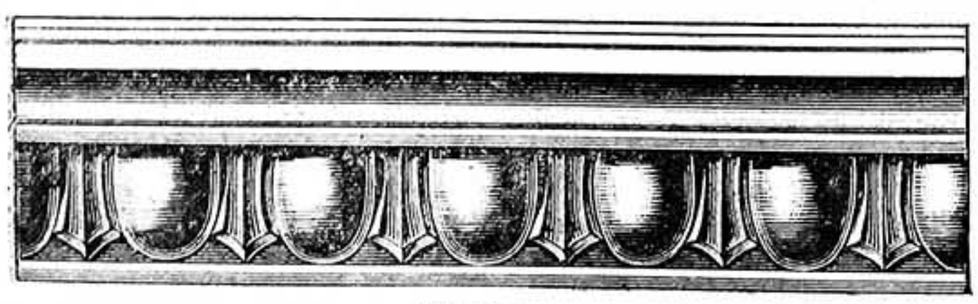


Fig. 6.



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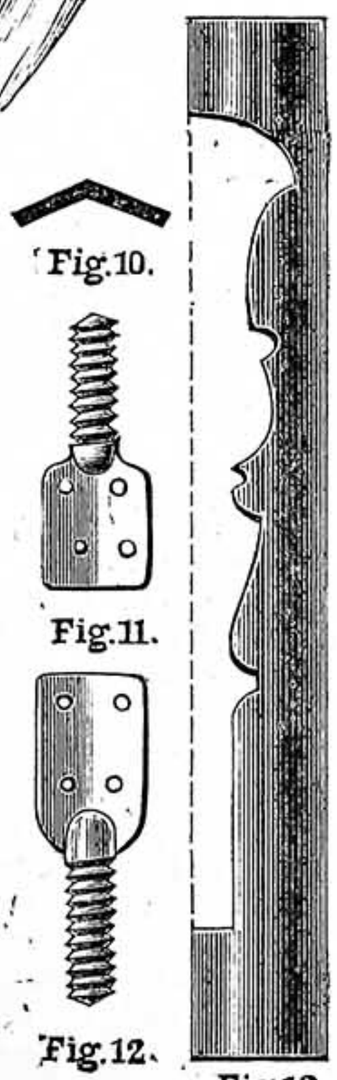


Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

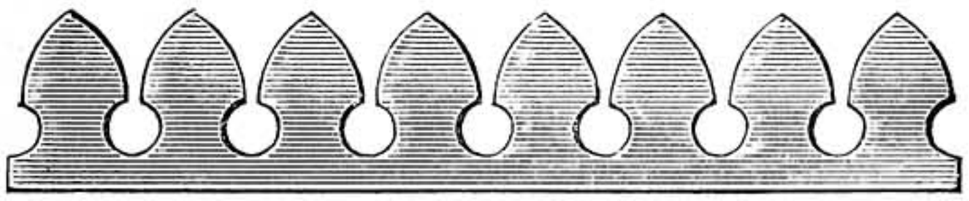


Fig. 8.

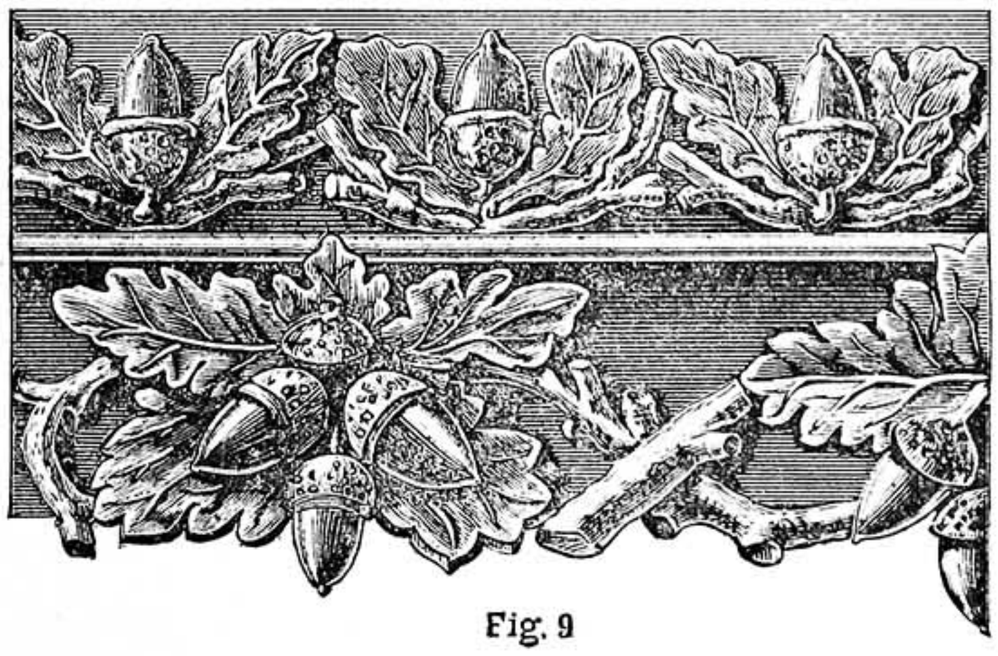
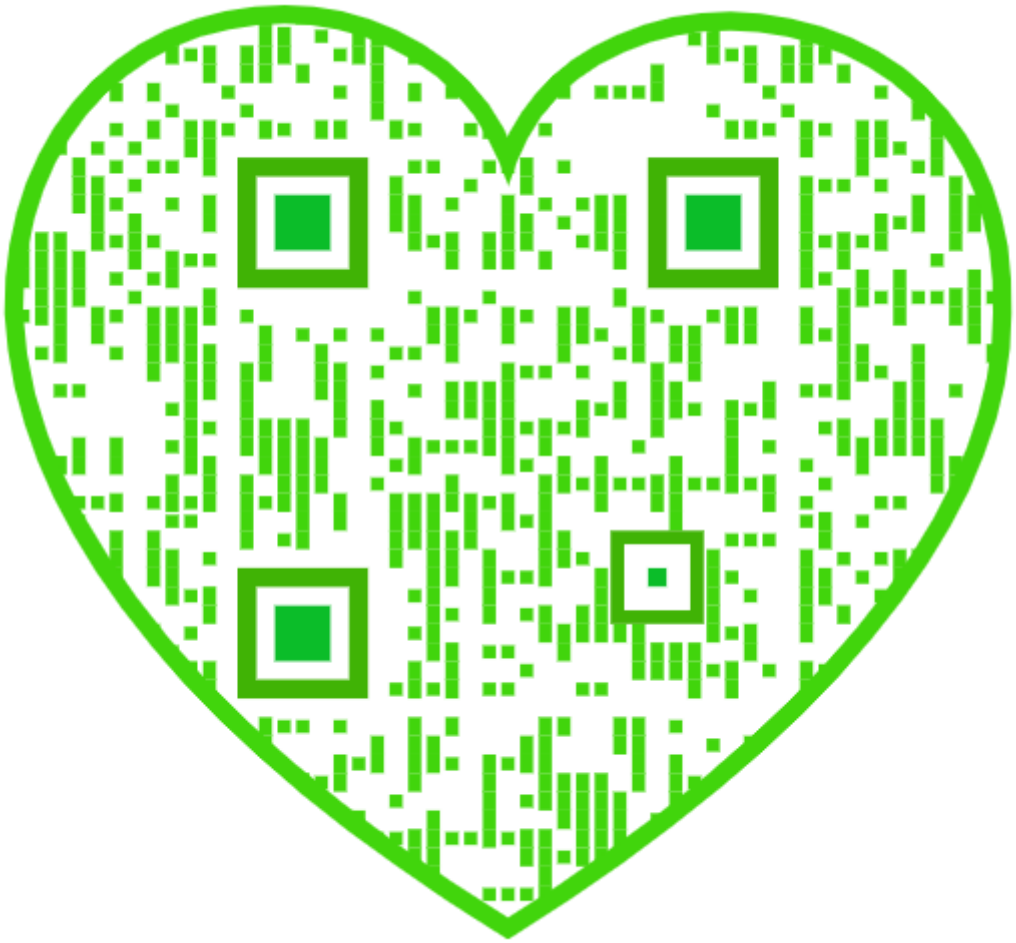


Fig. 9

Fig. 1.—Perspective View of Canopy. (For Figs. 2, 3, 4, 5, see next page.) Fig. 6.—Enlarged Stamped Plate, 3 in. to 1 ft. Fig. 7.—Egg and Tooth Moulding 3 in. to 1 ft. Fig. 8.—Cresting cut from Sheet Brass. Fig. 9.—Enlarged Stamped Plate, Alternative Pattern, 3 in. to 1 ft. Fig. 10.—Section of Upright. Fig. 11.—Fixing for Vases. Fig. 12.—Fixing for Pendants. Fig. 13.—Enlarged Profile of Tube cut to fit Face of Stamped Plate.



designs, which they will obtain from Birmingham if preferred to those they have. Anyone, therefore, wishing to make a canopy on the lines of the present construction is not obliged to accept any of the patterns here shown, but can select others according to individual taste.

In Fig. 9 I give one of these alternative stamped plates, Fig. 6 being the one I have used. These are drawn quarter full size—*i.e.*, the full size is 12 in. long exclusive of laps—and the price per foot lineal of Fig. 6 is 1s. 4d., or Fig. 9, 2s. 3d., and the "egg and tooth" moulding about 7½d. per foot run; so that the cost is very moderate. Six plates of each are required, so that 11s. 9d. covers that. The tubes for the corners, cresting, vases, and pendants, curtain-rod and rings, and the iron for the framing, with the flower pendants or the alternative bent tubes for the bays next to wall, would cost from 7s. 6d. to £1 more, according to the design chosen.

From the half plan, which is drawn to 1½ in. scale—*i.e.*, one-eighth full size—it will be seen that each bay is the length of the plates as sold—viz., 12 in. in the clear—and the tubes at each angle cover the joinings of the plates where they lap over, thus making a finish. Any of these parts not kept by the ironmonger can be had of chandelier makers.

For the framing, iron, preferably galvanised, ½ in. by ⅛ in., will be sufficiently strong, and consists of a flat back frame riveted together and the octagonal part riveted also to it. I have shown the back frame, *e e e*, etc., in Fig. 4, made of three pieces of iron, the upper one turned on an anvil so as to form top and sides in one piece, the two rails being riveted on the back of two sides in their proper position afterwards. My reason for this is that at the top corners not only must the octagonal upper rail be riveted to the back frame, but the fixing that is to carry the brass tube with the vase, V, must also be riveted thereto, so there would be *four* thicknesses to rivet together. I evade one of these, the lug of the fixing for the vase, by planting it on the end of the side of octagonal framing, and by making the back frame in one piece, avoid another of the thicknesses, so as to have only two to rivet together.

Having bent the three rails of the octagonal framing to the proper angles, which is best done by first making a template of ½ in. board cut to shape and battened, the ends for riveting to the back frame should be turned square of an L shape, about 1½ in. long, as in Fig. 11, which is an enlargement to quarter full size of the corner of back frame and octagonal framing, showing how they are to be joined together by rivets, and also how the lug of the vase fixing should be fixed.

When these three rails are fixed to the back framing, we have to arrange for the uprights at each angle (why should they not be called *downrights*, since the ideal of the canopy is inevitably that of suspension from the top member?). These may be made of one piece, bent to the section shown in Fig. 10, or of two separate pieces, each riveted to the rails, *a*, *b*, *d*, of the framing, one on each face of the octagonally bent rails. It is to these uprights, or "downrights," that the stamped brass plates are to be attached at their ends under cover of the, afterwards added, thin brass tubes at each angle. There are two ways of fixing these stamped plates: soldering to the tinned or galvanised iron framing, or, better still, riveting with copper rivets. I say better still, as the heating of lacquered brass by the soldering "bit" is very apt to discolour it beyond the limit covered by the brass corner tube, which would be very unsightly indeed. Two rivets at each end of each plate would be amply sufficient, or, as an alternative, the uprights could be drilled and tapped for small screws, which could be removed should the plates ever require relacquering, and be replaced very readily.

If in certain readily imagined circumstances difficulty in making the back frame is shown, small bolts and nuts might be substituted throughout for rivets, and the whole canopy could be taken to pieces, packed *flat* for travelling, and re-put together again whenever required. In this connection there is very little extra trouble in the substitution of small bolts for rivets, and it is evidently worth the difference to be able to take every joint asunder for cleaning, if not for transit; whilst the back frame could be then made of five separate pieces instead of being turned so that top and ends were in one piece as shown, as the bolts might just as well pass through three thicknesses as two, whilst riveting would not be good construction in such a case, although it might answer, as there is but little strain and but little weight to carry.

At *h* in the two drawings of the back frame is a hole of the form of an inverted keyhole—a provision for hanging the canopy to the wall—the circular part of the hole being sufficiently large to allow of a brass-headed nail passing through it, the slot above being as wide as the nail itself, so that when the weight causes the back frame to drop into its place, the nail-head prevents any tendency to slip forward. I prefer builders' "spout nails" to brass-headed nails, for they are stronger and more reliable, and are made specially to hold in the joints of the bricks of the wall without plugging, which offers harbour for insects.

Having completed the iron framing, the foundation upon which to build up the ornamental exterior, the next operation is to provide means whereby the brass tubes at each angle and the longer ones next the wall may be held in position. This may be done as shown by riveting, or by screwing to the uprights specially made fixings of the form shown in Fig. 11 (quarter full size), having a forged lug to a screwed end for the vases to be tapped to, and in Fig. 12 a similar one for the reception of the stamped pendants (which in the case before us are each made of the two stamped sides of gasalier weights), and these should be tapped to screw on to the screwed shanks fixed at the lower end of the uprights of the octagonal framing. Now, the diameter shown in the drawings for these thin brass tubes is about 1¼ in.; the screw for the vases and pendants is but ⅜ in. It follows, therefore, that a discrepancy or void has to be in some way made up in order to maintain the tube in position. I use "washers," 1¼ in., filed down to fill the interior of the tube, with ⅜ in. hole in centre, one at top and one at bottom of the tubes, the outer periphery of which enters the tube and prevents it moving sideways, whilst the hole in the centre fits the screwed shank and the vase in one instance, and the pendant in the other case, well screwed up, holds everything "taut," to use a nautical but expressive phrase.

It must be recollected that the tubes, as well as the stamped plates, are already

Fig. 2.

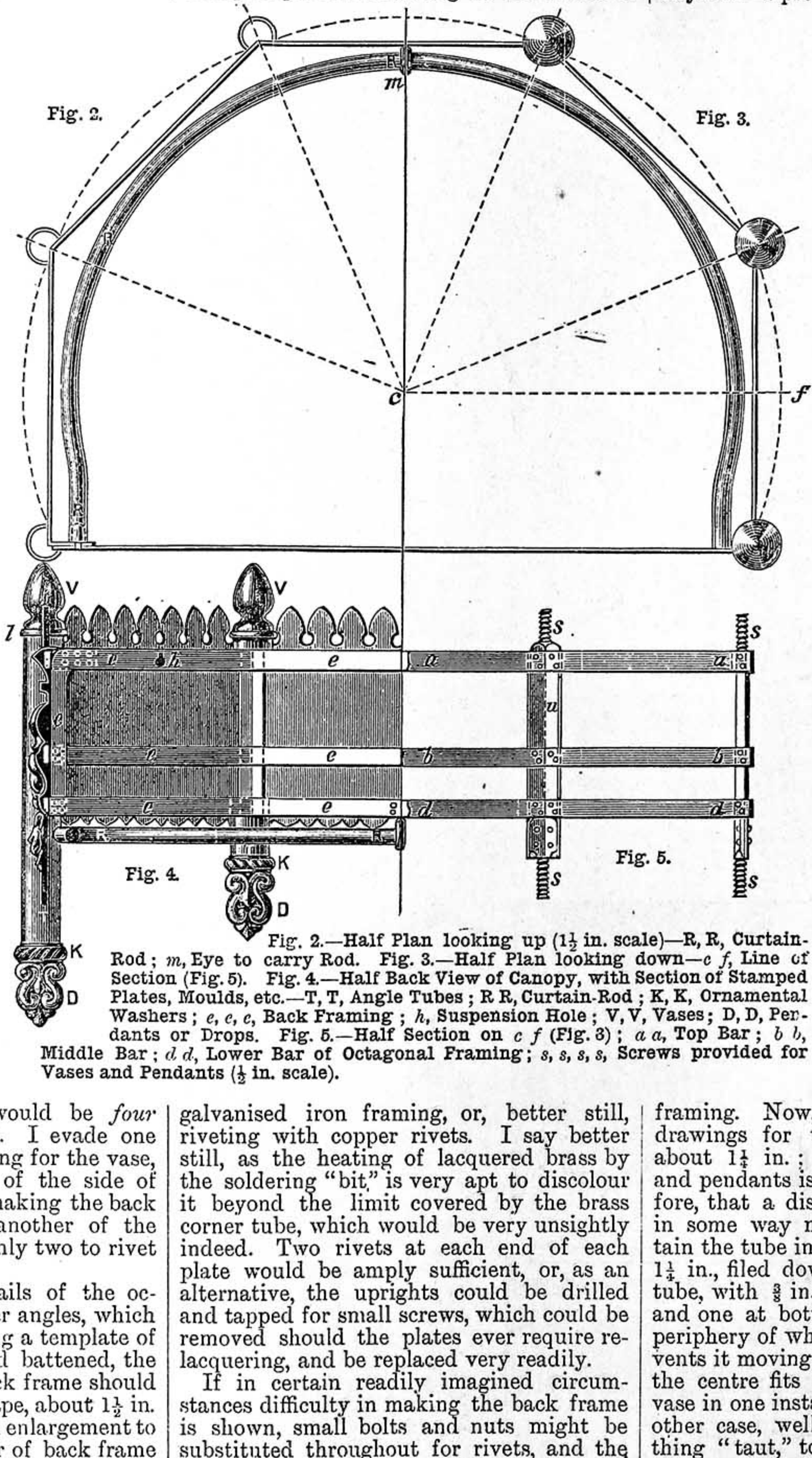


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 2.—Half Plan looking up (1½ in. scale)—R, R, Curtain-Rod; *m*, Eye to carry Rod. Fig. 3.—Half Plan looking down—*c f*, Line of Section (Fig. 5). Fig. 4.—Half Back View of Canopy, with Section of Stamped Plates, Moulds, etc.—T, T, Angle Tubes; R R, Curtain-Rod; K, K, Ornamental Washers; *e*, *e*, *e*, Back Framing; *h*, Suspension Hole; V, V, Vases; D, D, Pendants or Drops. Fig. 5.—Half Section on *c f* (Fig. 3); *a a*, Top Bar; *b b*, Middle Bar; *d d*, Lower Bar of Octagonal Framing; *s*, *s*, *s*, *s*, Screws provided for Vases and Pendants (½ in. scale).

lacquered, and therefore we have to rely on the fitting, as soldering or running metal (lead) in is out of the question; but if care is taken to make the screws central, and the washers are made a "tight fit" in the ends of each tube, the tubes themselves can never even shake.

Hitherto the construction has partaken of the easiest, but we now come to the test—that pleasurable but difficult operation of fitting the angle tubes destined to cover the junction of the stamped plates.

The lengths of tube, cut off exactly the same, and filed finely to a perfectly square end, have now to be cut to the section obtained from the front face of the stamped plate which forms the various members of the canopy design. The tubes at ends, as shown, are intact, but in between they must be cut away from behind, so as to form a good joint against the face of the stamped plates already fixed to the foundation or frame which supports them in place.

Fig. 13 gives a profile of one of the tubes cut to fit the face of the plates whose joining the tube has to cover and conceal. This part of the business is the only difficult part of the construction, and affords therefore the most scope and the most delight in carrying it out. I presuppose that the rivets or screws have been put into the flat part of the stamped plates—*i.e.*, their lowest plane, which, of course is the nearest to the uprights of the framing—so as to avoid all bending of them out of shape.

A very easy dodge to make a template is to warm a piece of gutta-percha sheet at the edge and bed it firmly to the stamped plate till it takes the exact form, and when it is cool and hard again you can scribe the tube to the exact line you require. The tubes shown here are plain burnished thin brass tubes, but they may be had covered with pattern, ribbed, spiralled, or to almost any imaginable design, and of larger or smaller diameter. I never like to tie anyone down to following slavishly any design for construction; I prefer infinitely to suggest as many other ramifications of the idea as I can. When a man takes pains and trouble to make any object for his own home, its possession gives him many times the pleasure if it be unique of its kind and design than if, as is too often the case with bought fretwork patterns, he can see it carried out in fifty different homes just as he has himself done it; and for this reason I endeavour to give alternative modes of carrying out my ideas.

I here throw out the hint that instead of purchasing ready stamped plates, lovers of repoussé work may indulge their proclivities in their own peculiar way, and thus produce a much more elaborate and beautiful, and far more valuable, piece of canopy-work than the cheap though effective suggestion of the present paper. In such case the two bays or panels next the wall might be treated differently to the others, and the centre front one could be altered to suit, thus getting rid of what I confess is the drawback in my present design—its formality as a whole, necessitated by utilising what is already in existence instead of being specially designed and made expressly.

Having cut the tubes to fit against the face of the plates, and then put them into place, so as to cover up the joinings or laps of the plates, the ornamental rings at K, K, *l*, *l*, which form a finish to the ends of the tubes and conceal the supporting washers, should be next fitted. It must be borne in mind that the fixing to carry the pendants should not be riveted to the framing until the tubes and these ornamental rings are fitted, as it would not be possible to get the tubes on after these were once fixed, as is self-evident. For this reason, instead of riveting, screwing them on to the frame from the inside would be better—an operation that would thus be much more easily performed.

In order to maintain the rigidity of the octagonal framing, a round rod at the centre line should be inserted from one top rail to the other, which should be filed down a little to fit a hole drilled in each smaller than its diameter, and passed through and riveted at each end. Immediately under this rod, at the point *c*, the curtain material could be plaited in rays and stitched round the rod, thus forming a centre concealed by a covered button, if desired.

The curtain-rod itself consists of a length of brass tube bent to the shape shown, and passed through an eye which is riveted to the framing at *m*, the centre of the front lower bar of the frame, and sprung on to pivots or studs at each end, which have been tightly screwed previously into the lower bar of the back frame. Enough spring can be obtained by not bending the tube quite far enough for the width apart of the studs to maintain it normally in position, yet allowing of its being taken off at will to permit of the rings coming off with the curtain to be washed, if washable; if not, of brushing, or, if need be, re-dyeing them.

The back cloth should be plaited to a tape the same length as the top back frame rail, and two small rings which would pass over the screw below the neck of the vases next the wall before they were screwed down would form a convenient mode of fastening each end of the tape, and keep it stretched tightly across.

The curtains should each be a yard and a half wide, box-plaited to a tape to which the curtain-rings could be attached either by pin-hooks or by the ordinary stitching with strong thread, and hemmed at the bottom, and either with or without fringe. No cloth valance is required, but if preferred, it could be readily fixed with tape ends or strings to tie round the lower bar of the octagonal framing to conceal the curtain-rod and rings, as the plates when fixed leave an interstice between themselves and the frame bars, being fastened to the uprights which are planted on to these bars.

The cresting, which may be cut out of thin sheet brass, should be turned up L shape at lower edge to its inner side, so as to stand and rest upon the top of the upper member of the cornice, to which a couple of copper wire rivets in each length would conveniently attach it; or eyes could be cut at each end of each length to pass under the vases on the L flange, which is turned under, going round the screws that fix the vases, thus holding it firm at ends.

In the end bays next the wall, to overcome the stiffness and formality of the straight cornice dying into the tube, either a tube bent round as shown in the perspective view (Fig. 1), or a stamped flower finial, should be added, fastened with small screws to the endmost tube, which it will be seen is left longer than the other four. These end bays are simply to be considered as brackets, and should fulfil this idea of supporting the projecting canopy. This completes the construction.

Various modifications may be made, according to individual taste, either in the form of the design or in the colouring of the lacquer. For instance, the plates (Fig. 6) may be of rich gold, whilst the upper member (Fig. 7) might be lacquered Florentine bronze colour or dark green; and the colour also of the tubes could be varied if preferred; and no doubt other alternatives will suggest themselves.

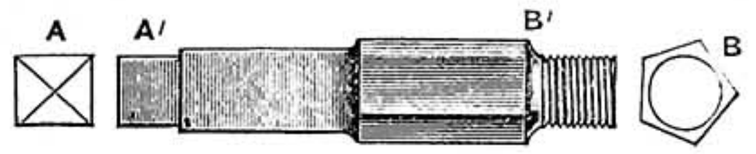
A USEFUL RIMER OR BROACH.

BY T. R. BLACKETT.

SKETCH OF TOOL—ITS CUTTING EDGE—EXAMPLE OF ITS USE—ECONOMY OF TOOL.

THE sketch given here will be enough to the skilled mechanic to grasp the use for which it is intended, but for the sake of our readers in general I will give a full detail of its uses.

The sketch is of a rimer, or broach, as some call it, screwed at the end. Take, for example, that the tool is for a $\frac{7}{8}$ in. hole. The screwed end is to be screwed with a good $\frac{7}{8}$ in. Whitworth thread, say, up to $\frac{7}{8}$ in. from the end; here to have a shallow recess $\frac{1}{4}$ in. wide, according to sketch; then to be squared down with a side tool in the lathe $1\frac{1}{8}$ in. from the end. This forms the cutting edge of the rimer. The rimer part of the tool, while it is being forged, must be kept large enough to be filed up in cants, whose section must be in the form of a



Form of Rimer or Broach—A, End View at A'; B, End View at B'; Screw, $\frac{7}{8}$ in. Whitworth Thread.

pentagon or five-sided figure. This can be carried up for, say, a couple of inches, and to be large enough to rime a hole out which will nicely fit the unscrewed part of a tap bolt or turned stud.

Now to its use. Supposing we have to fix the pedestal of a governor on to the bed-plate of an ordinary horizontal engine. The foot of the pedestal having been drilled to suit the $\frac{7}{8}$ in. studs by which it is to be bolted to the bed-plate, and as its pulley has generally to be parallel with the engine crank shaft, we set it in that position and mark with a scriber through the holes in the foot of the pedestal. The holes in the bed-plate are then drilled with a ratchet brace and a drill that will just go into an ordinary $\frac{7}{8}$ in. nut; these holes are then tapped.

Now, if we were to put the studs into their places and try our pedestal on, we would find in nine cases out of ten that we were a *very little* out. It is to rectify this error that this tool is intended.

We now place the pedestal on the bed-plate in the position in which we marked the holes. Take two old tap bolts, with their unscrewed parts filed down level with the threads so as not to touch the pedestal; these, if placed in the opposite diagonal corner holes and screwed down tight, will hold the pedestal steady. Now take the tool and screw it down the other two holes until the face at B comes through the pedestal and touches the bed-plate. Having done this, take off the pedestal, and put in the two studs (where we have had the tool); then do the same with the other two holes, put the studs in, and the job is finished.

There will be no cause to fear the possibility of the pedestal shifting by the wear and tear of its working; it will be too good a fit, and exactly parallel with the crank shaft as required.

To make such a tool or set of such tools screwed to suit the different sizes of studs, would save time, money, and trouble in the majority of cases.

For instance, a tap bolt has to be screwed into a job in a hurry. Well, the hole in the flange through which it has to go is found to be a *shade out*. It would be better just then to put a tool through of the proper size, then put in the tap bolt as required.

If we had not such a tool, we would have to take the whole job down and file the hole out, thus taking, perhaps, four times the time, not making such a good job of it, and losing a lot of patience.

This tool, of course, must be made of tool steel, kept soft until it is filed up, and then to be tempered.

[The name of the tool described above has been here given as "rimer." To save any reader the trouble of writing about it under the supposition that it is a blunder, let me say that it is generally spelt "reamer," and that this is really the right way of doing so. But it is spelt in many different ways by engineers, and usage renders "rimer" or "rhymer" as admissible as "reamer."—ED.]

thickness which the ends of the staple penetrates the firmer will the staple probably be), cut it to the desired thickness, as in Fig. 46. A pair of discs will be also utilised. These will fit securely on to a handle, as in Fig. 46. The distance between the wheels must be exactly the same as the thickness of the staple, and the diameter of each should nearly correspond to the width of it. Over that part of the handle which lies between the wheels will be screwed a piece of tubing or turning, sufficient in diameter to allow it to touch the inner edge of the staple.

The wheels might be turned from a piece of hard and tolerably thick wood, but it is advisable that the staple be of iron.

Completely through the wheels, etc., should be bored a pair of holes, close up against that part of the handle which penetrates them, each hole being in diameter sufficient to be capable of receiving the largest gauge of wire that it is considered will be used. In Fig. 47 is shown an elevation, by the assistance of which my foregoing remarks may be the better conveyed in an understandable manner.

by reason of the natural shortening of the wires.

Were the first requirement ignored, the liability remains of the wires going on excursions every now and again to either side of the imaginary straight line upon which they should travel; and in the case of the latter consideration being disregarded, it would frequently be found that the weight would appear rather dilatory by remaining where it was at first placed and allowing the wires to be drawn from underneath it.

To those who desire to be nice in everything they do, my advice is to insert a metal plate flush with the top of the bench upon which the wires will twist, or to at least work upon a part of the bench which may be comparatively smooth.

It is astonishing what can be accomplished by the aid of a machine such as I have just been describing. If proper judgment is exercised in the selection of the weight, and due care is taken in having the machine to fit nicely together in all parts, and, in addition, the work is progressed with upon smooth ground, by rapidly turning the handle for a few moments, several yards of

Letters in Diagrams represent Correspondence of Parts.

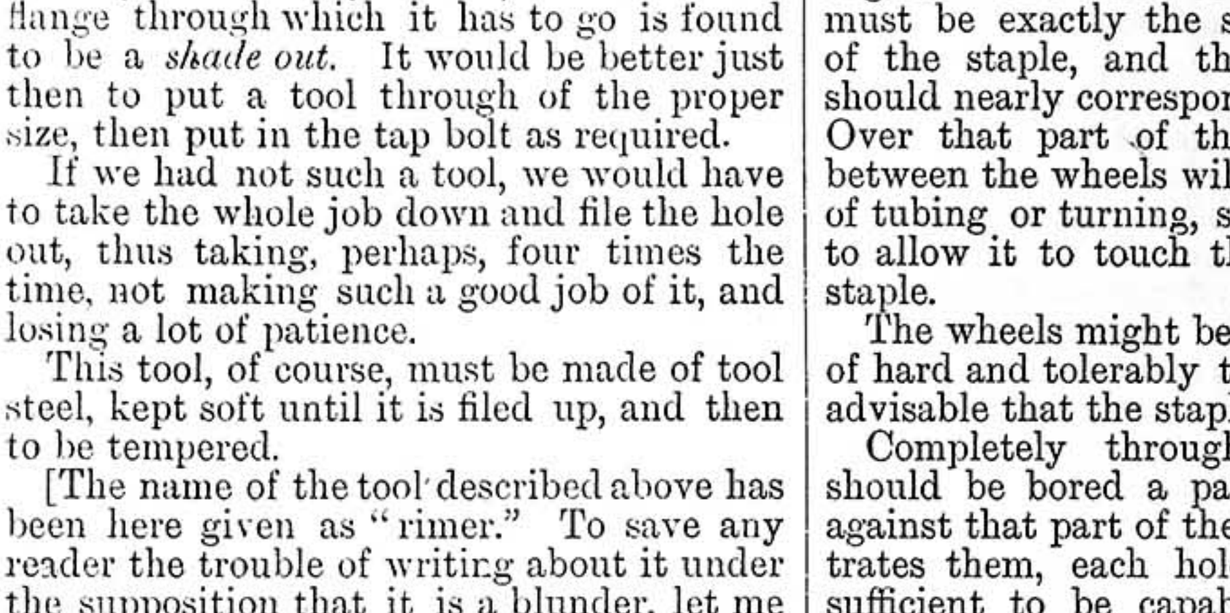
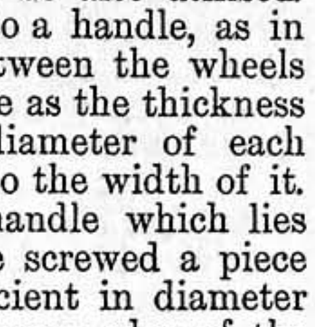


Fig. 46.—View of Twisting Machine, complete.

Fig. 48. — Wheel of Twisting Machine.



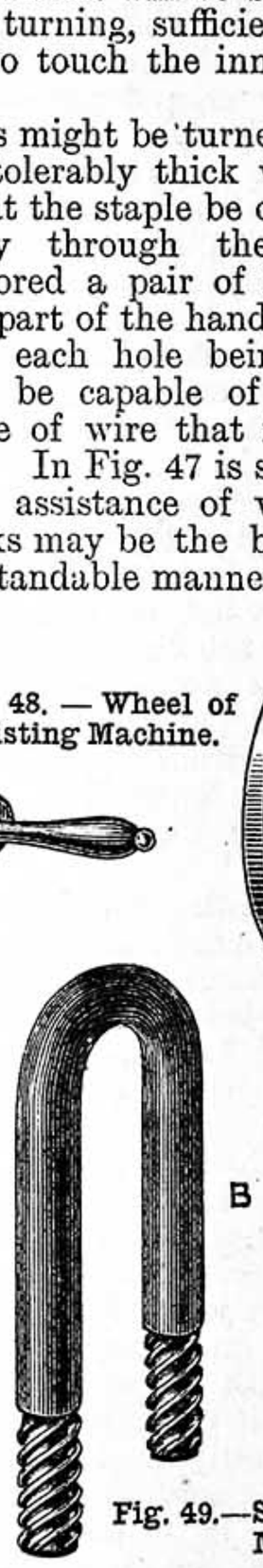


Fig. 49.—Staple of Twisting Machine.

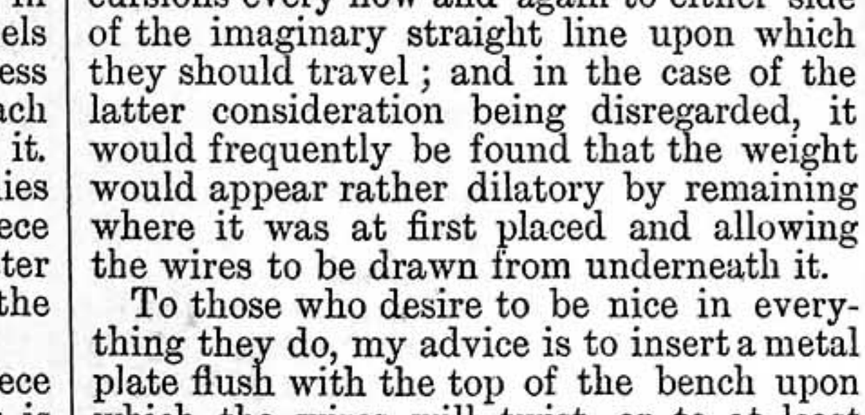


Fig. 47.—Elevation of Twisting Machine.

Fig. 50. — Section of Twisted Wire.

WIRE-WORK IN ALL ITS BRANCHES.

BY JAMES SCOTT.

TWISTING—A TWISTING MACHINE.

STAPLE OF MACHINE—STAPLE FITTED TO BENCH—DISCS OR WHEELS—HANDLE—WHEELS, HOW PLACED—WEIGHTING FREE ENDS OF WIRE—METAL PLATE ON BENCH—RAPIDITY OF WORK.

TWISTED wires are utilised to a very great extent as being capable of producing better ornamental effects upon any particular work in which they may be introduced, and certainly they are to be preferred, in a number of cases, to merely plain or straight wires.

It is my intention to give, later on, designs of such articles in wire-work as I may consider sufficiently serviceable to warrant their publication, and in some of these patterns I shall represent twisted wires.

A glance at Fig. 46 will be necessary to understand one method, which is as convenient as any other, of thus twisting two wires; or, what amounts to precisely the same thing, one wire doubled together. A staple of stout iron with spiral ends is required, and nuts to screw on to the ends of it. This staple is fitted to the bench, and I must here say that should the latter be considered too thick (although the greater the

The wheels, etc., are placed underneath the staple so that they may be turned freely by means of the handle attached. The ends of the wires to be twisted should be placed through the holes in the wheels, from the bench side of them, and then tied. If they are short it will be only necessary to work at the side of the bench, but if the wires are of any great length it will be expedient to work from the end. It will, therefore, be understood that it is advisable to have a pair of staple holes at both the side and the end of the bench, to be made use of when occasion arises.

The free ends of the wires should then be placed side by side flat upon the bench, or else tied in a clean knot. Upon this end of them must be a weight, and experience will be the only adviser as to the heaviness of it. The handle is then turned, the consequence being that the wires are twisted to a certain degree, the natural result being to shorten the distance in the length occupied by the pair.

It is upon this that the heaviness of the weight just alluded to must depend. It is required to be of sufficient pressure to keep the wires in a perfectly straight line whilst being twisted, and also to be not too heavy to permit it to advance towards the staple

wire may be regularly twisted. To gain an idea of the relative proportions of twisted and untwisted wires, it is necessary only to take a couple of wires, each a yard in length and of thin gauge, and twist up to the utmost limit, and a couple of wires of thick gauge, of the same length, also treated similarly.

KNOTTING, SPLICING, AND WORKING CORDAGE.

BY LANCELOT L. HASLOPE.

RING KNOTS.

SLIPPERY RING KNOT—BOAT KNOT—LARK OR DOUBLE BOAT KNOT—LARK'S HEAD—LARK'S HEAD STOPPERED—LARK'S HEAD WITH CROSSED ENDS—DOUBLE LARK'S HEAD—TREBLE LARK'S HEAD—BACKHANDED SAILOR'S KNOT—CAPSTAN KNOT—SAILOR'S KNOT—GUNNER'S KNOT—ARTILLERYMAN'S KNOT.

WE have very commonly to make a rope fast to a ring, and there are a variety of methods of doing so, some of them identical with knots used for other purposes; but as they have their own names, I have thought it best to give them here. Fig. 43, where the end is passed through the ring, and a bight put under the standing part, is a ready way

of temporarily fastening the painter of a boat to the ring of a pier; as in the Stationary Knot, a sharp pull at the end of the rope frees the painter at once. This is an excellent fastening for many purposes. Fig. 44, called the "Boat Knot," is another good way of mooring a small boat. It is made in the same way as a Marlinespike Hitch, the only difference being that a thowl pin or other small piece of wood is put through the centre of the knot instead of a marlinespike. By withdrawing the pin a bight through the ring, and drawing the two parts of the rope through the bight; or where this is not practicable by reason of one end of the rope being fast, the end may be passed up through the ring behind the standing part, and down through the ring and bight again. Sometimes, instead of stoppering this knot with an overhand knot, as in Fig. 47, we seize the end to the standing part with twine or other small stuff.

Fig. 48 is a "Lark Knot" with crossed the ring and through the loop just made and hauled taut. In Fig. 50 we have the "Treble Lark's Head," which, though it looks complicated, is more easily made than its appearance would lead us to expect. First bring the bight of a rope up through the ring, take one of the ends, and pass it through the bight, and up through the ring, and then down through its own bight; do the same with the other part and the knot is formed.

In Fig. 51 we have a "Backhanded

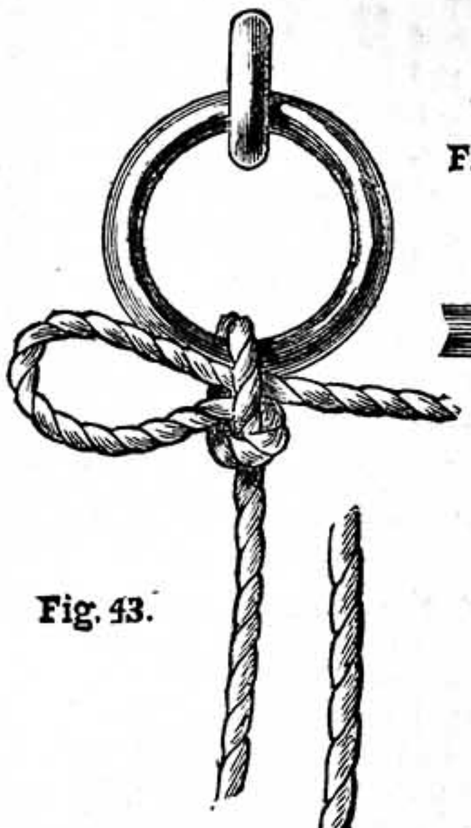


Fig. 43.

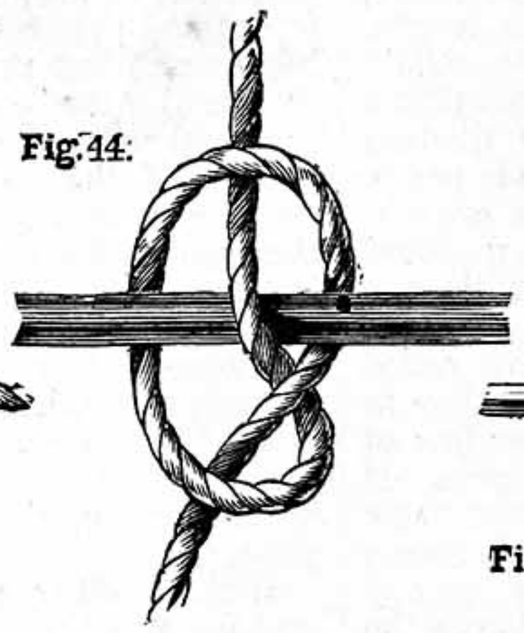


Fig. 44.

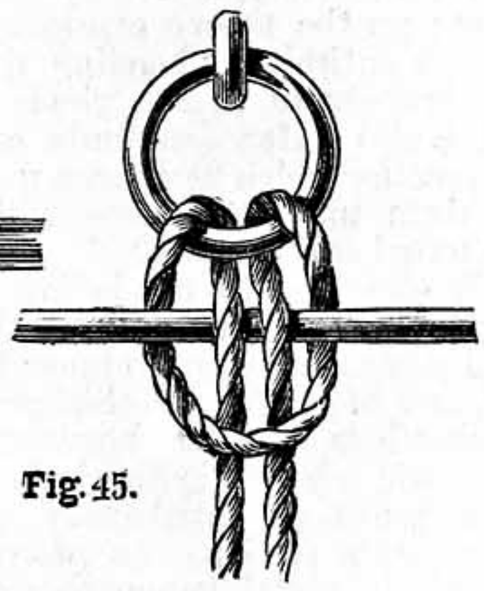


Fig. 45.

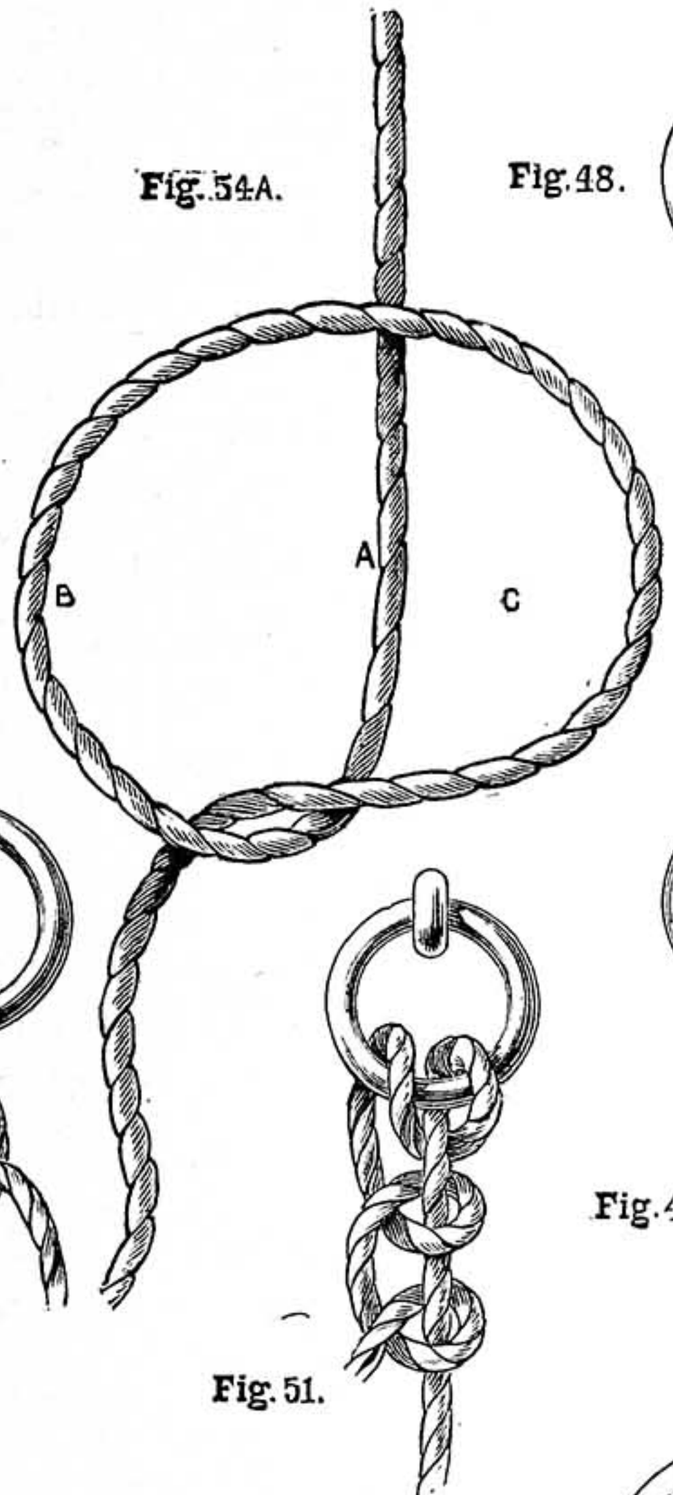


Fig. 54A.

Fig. 48.

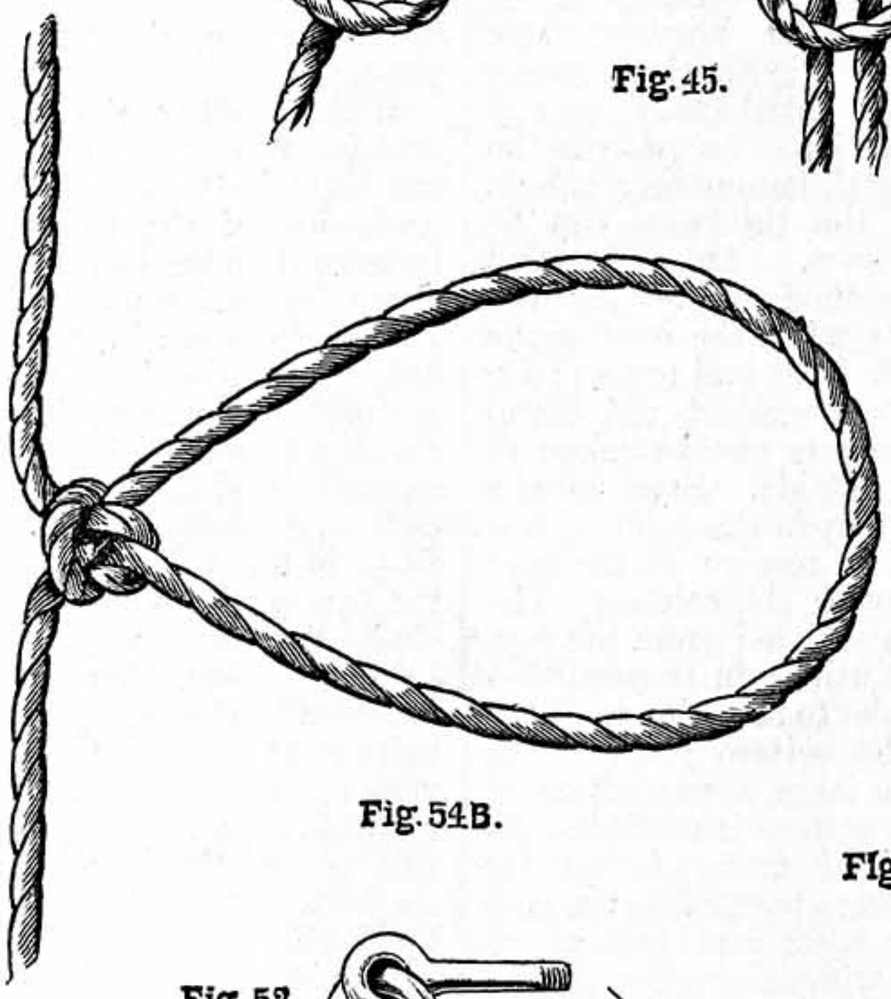


Fig. 54B.

Fig. 53.

Fig. 51.

Fig. 49.

Fig. 47.

Fig. 46.

Fig. 52.

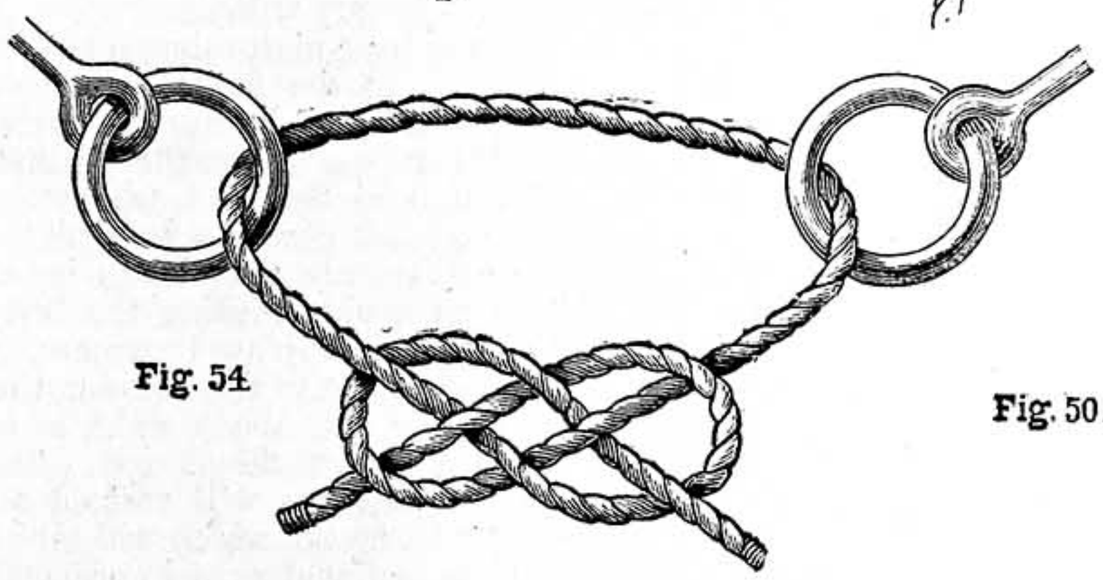


Fig. 54

Fig. 50.

Fig. 43.—Slippery Ring Knot. Fig. 44.—Boat Knot. Fig. 45.—Lark Boat Knot. Fig. 46.—Lark's Head. Fig. 47.—Ditto, Stoppered. Fig. 48.—Ditto, with Crossed Ends. Fig. 49.—Double Lark's Head. Fig. 50.—Treble Lark's Head. Fig. 51.—Backhanded Sailor's Knot. Fig. 52.—Capstan Knot. Fig. 53.—Sailor's Knot. Fig. 54.—Gunner's Knot. Fig. 54 A.—Artilleryman's Knot commenced. Fig. 54 B.—Artilleryman's Knot finished.

the knot comes adrift of its own accord. Fig. 45 is another form of boat knot, called the "Lark Boat Knot," or "Double Boat Knot." This differs from the last knot, inasmuch as a bight, instead of a single end of rope, is put through the ring; a piece of wood is used to fasten it, as in the Boat Knot. It is rather the better knot of the two. If, instead of the ends being brought down outside the bight after it has been passed through the ring, they are put through it, we have a "Single Lark's Head" (Fig. 46), and in Fig. 47 we have the same knot "stoppered." It may be made by passing ends, and is made in the manner I have described, where one end of the rope is fast, except that the end at last comes over instead of through the bight. The ends are often stoppered as in the last knot. If we take the standing part in one hand and the end in the other, and draw them apart, we shall find, though with a name of its own, this is really nothing more than a "Clove Hitch" or "Builder's Knot" under a different name and different circumstances.

In the "Double Lark's Head" (Fig. 49) a bight is first made, and the ends passed through it; the ends are then put through Sailor's Knot." It is made by passing an end through the ring round at the back of the standing part and through the ring again, and finishing with two half-hitches round the standing part. It may also be made with the end in the last turn put under the standing part and under its own part. Fig. 52 is the "Capstan Knot." Cross the end of the rope after it is through the ring, bring it round the standing part, through the first bight and through its own bight, thus forming a sort of figure-of-eight knot.

Fig. 53 is a "Sailor's Knot," composed of

two half-hitches round the standing part of the rope. This is one of the most useful and easily-made knots we have, and is very much used as a mooring knot.

A "Gunner's Knot" (Fig. 54) is simply a "Carrick Bend," made with the two ends of a rope after it has been passed through two rings. Gunners themselves call this a "Delay Knot."

The knot shown in Figs. 54 A and 54 B is called "Manharness," or the "Artilleryman's Knot." It is used when hauling guns over a difficult country, when horses cannot be employed to get them into position. It is a most valuable knot where heavy weights have to be drawn with ropes, as by its use a man can exert his strength to much greater advantage than he could by merely grasping the rope with his hands. To make it, form a half-hitch, turn it round, and lay it against the standing part. This is, in fact, a Marlinespike Hitch, and is represented in Fig. 40 (page 200). Now pass the right hand into the bight C, and going under A, as shown in Fig. 54 A, grasp the part B, and draw it through C until a loop of sufficient size is made. When using it, the head and one arm are passed through the loop, as shown in Fig. 54 B, which gives the knot finished. A little care is required in closing the knot, so that the turns may jam properly one against the other, or the knot will slip.

When several men are employed, a bowline is generally made at the end of the rope, and as many loops as there are men to haul at equal distances along it.

CAST-IRON COLUMNS.

BY G. H. BLAGROVE.

FORM OF HOLLOW CYLINDER ECONOMICAL—OBJECTION TO FORM—TESTING METAL AND THICKNESS — BASE-PLATES — BED-STONES — FIXING COLUMN AT BASE—BOLT-HOLES—SEATING—STRENGTH OF CAST-IRON COLUMNS—ESTIMATES—PRICES.

IT is generally admitted that the most economical form for a column is that of a hollow cylinder. What we require in a column is that it shall not bend; and if we can ensure this, it will safely resist any crushing strain likely to be brought upon it. The greater the diameter of the column in proportion to its length, the greater will be its resistance to bending. This may be illustrated in the case of a cane, which is bent by a person leaning upon it. The material on the inside of the bend is compressed, while that on the outside is stretched. The greatest deflection occurs midway in the length of the cane, where the greatest tension and compression of the material occur. In a cross-section of the cane at this point there would be a neutral line running at right angles to the direction of the bend, where the material would be neither stretched nor compressed. The neutral line would probably be near to the centre of the cane, but its position would depend upon the nature of the material. If the latter were more easily stretched than compressed, the greater proportion of the cane would be subjected to tension, and the neutral line would be nearer to the inside of the bend. This neutral line may be regarded as the fulcrum upon which the two half-lengths of the cane turn like levers, the fibres of the cane being stretched or compressed according as they are situated on one or other side of the fulcrum. The distance of any single fibre, measured at right angles to the neutral line, may be regarded as the short arm of the lever; and the greater that distance is, upon the well-known principle of the lever, the greater resistance is opposed to the movement of the long arms. Hence, a cane of the same sectional area, but hollow, and, therefore, of greater diameter, would be more difficult to bend, because its material would be concentrated further from its axis. Upon this simple principle of leverage depends the truth of that theoretical formula, according to which the strength of a column varies directly as the fourth power of its diameter, and inversely as the square of its length. True as it is in theory, it is only partially true in fact; for the theory assumes that a column yields entirely by bending, whereas experience has shown that it yields partly by crushing also. Hence formulæ are employed in practice which have been modified to bring them into accordance with the results of actual experiments.

The only objection to the hollow cylindrical form for a cast-iron column lies in the difficulty of examining the inner face of the metal, and of testing its thickness. If proper precautions are taken, however, there is no reason why a hollow cylindrical column should not prove as satisfactory as any stanchion of open section. As regards the soundness of the metal, hammering affords a reliable test, and the thickness can be measured with callipers. An easier and more satisfactory method of testing the thickness is available when the core of the column runs through from end to end; for then rods can be held against the metal inside, and measurements can be taken to these rods from the outside. Even when a girder is to be carried upon the column, and a boxing is cast on to receive it, the core may run right through the column. The circular piece of iron omitted from the cap-plate would be of no utility in transmitting pressure from the girder to the column. What is wanted is that the bottom plate of the girder shall cover as large a proportion of the section of the column as is possible. As a rule, the process of fixing is greatly facilitated when boxings for girders are cast separately; and the additional cost which this involves is very trifling.

The sizes of base-plates should be arranged in proportion to the loads upon columns, and to the carrying power of their bed-stones. When we know the diameter of the column, and the load which it is to support, we must devise a base-plate large enough to distribute that load over a sufficient area to avoid cracking the bed-stone beneath. If the base-plate be square, and its diameter twice that of the column, the proportion will be just about right, as can be proved by a simple calculation. To take an extreme case, we will assume a 9 in. column of $\frac{1}{2}$ in. metal, which will give about the smallest sectional area in proportion to the diameter that is safe or usual in practice. The sectional area will be 13·35 square inches; and as the safe load upon cast iron does not exceed three tons per inch, our maximum load in this case will be just forty tons. If we make our base-plate 18 in. square, it will, if solid throughout, have an area of 2·25 square feet. But we must deduct from this the bore of the column, which is 50·27 square inches, with an additional 4 in. for bolt-holes, making 54·27 in., or ·36 of a square foot, in all, which deduction leaves 1·89 square foot for the actual area of our base-plate. This is the area over which the forty-ton load will be distributed, and it works out at the rate of 21·16 tons per superficial foot. If the bed-stone be of good hard Yorkshire stone, it will safely stand a pressure of twenty-five tons to the superficial foot; and if of granite, it will stand forty. The base-plate should be of the same thickness as the metal of the column. The metal should spread from the column to the base-plate in a trumpet-shaped manner, the column being slightly thickened towards the base, and the base-plate being similarly thickened near its junction with the column. The object of this spreading and thickening is, of course, to provide adequately for transferring the pressure from the column to the base-plate; but the change of thickness in the metal must be brought about gradually, to avoid any danger from the unequal cooling of the casting. Some portion of the upper surface of the base-plate will, therefore, have a slight slope. The distribution of the pressure from above can be greatly assisted by means of gusset-pieces, of the same thickness as the metal of the column, and uniting the column to its base-plate. If bolts are used for fixing, there can only be four of these gusset-pieces abutting upon the four sides of the base-plate.

With regard to the fixing of a column at its base, this has sometimes been done without bolts, by means of lugs cast on to the underside of the base-plate, and let into holes sunk in the bed-stone. One advantage about dispensing with bolts is that diagonal gusset-pieces can be cast on, which is desirable when the load to be carried is considerable. But lugs, besides being liable to break off, do not afford such a secure fixing as bolts; and if lugs are used, it is advisable to form a square sinking, about half an inch deep, in the bed-stone, of the same size as the base-plate, to receive the latter, and preclude the possibility of its shifting. If bolts are used, this sinking need not be provided. There is no necessity to run the bolts right through the bed-stone, and provide them with heads and washers on the underside, as is sometimes done, for there will be practically no tensile strain upon the bolts. A good fixing may be obtained by sinking lewis-holes in the bed-stone, and letting in lewis-bolts. If the surface of the base-plate slopes where the bolt-holes occur, level seatings, or flanges as they are sometimes called, should be cast for the nuts; otherwise, it will be necessary to provide bevelled washers, which will involve some extra labour in filing.

Bolt-holes may be either cast or drilled. Of course, it is cheaper and more expeditious to have them cast. There is no objection to casting the holes in a base-plate which is to rest upon a bed-stone, or in a cap-plate to which the flange of an iron girder is to be bolted, the holes in the flange of the girder being drilled or punched. But when the bolt-holes are cast in two castings which have to be bolted together, one above the other, the iron may shrink unequally, and the holes will not be plumb over one another. In such a case, therefore, the bolt-holes, or at least one set of them, should be drilled.

All seatings, such as base-plates and cap-plates to columns, should be planed true, as it is difficult to ensure absolute freedom from slight irregularities in castings. Very slight irregularities will often suffice to produce grave results, by concentrating the pressure upon a few points, instead of letting it be distributed over a whole surface. All bearing surfaces should be packed with lead or felt, to prevent unequal pressure as far as possible.

The ultimate strength of cast iron in columns is found by experiment to be, for every square inch of sectional area, 28·5 tons at ten, and 17·8 tons at twenty diameters high. At about twenty-five diameters high, the strength is thirteen tons per inch, at which limit built columns of wrought iron have the same strength, and beyond which wrought is superior to cast iron. The safe load should be one-tenth of the ultimate strength; and it can be ascertained at a glance from those very useful tables for engineers which are issued by Hurst, Molesworth, and others.

In making estimates for cast-iron columns, the tables published in the above-named pocket-books will furnish the practical man with all that he requires. For instance, if we want a column 10 ft. high to carry a load of forty tons, we shall find that the external diameter will be 8½ in., and the metal ¾ in. thick. A table gives us the weights, per lineal foot, of cast-iron pipes, and the pipe we want is of 7 in. bore and ¾ in. metal, weighing 57 lbs. per lineal foot. Our column, therefore, weighs 5 cwt. 10 lbs. We must add a cap and base-plate, each 17 in. square, ¾ in. thick, weighing, at 28⅓ lbs. per square foot, just 1 cwt. By not deducting the bore of the column from these plates, the surplus will allow for the spread of the metal and for gusset-pieces. The total weight of the column will, therefore, be 6 cwt. 10 lbs., and its cost, at 10s. per cwt., will be £3 1s.

The price taken for the iron would include fixing, but an allowance should be made for the bolts. Four of these will be required for fixing the base-plate, and they may be of 1 in. diameter, and each 5 in. long, weighing, at 2⅔ lbs. per foot, just 4½ lbs. Four hexagonal nuts, at 1¼ lb. per pair, will weigh 2½ lbs., bringing the total up to 7 lbs. for bolts and nuts, which, at 4d. per lb., would cost 2s. 4d., bringing the cost of the column and bolts up to £3 3s. 4d. If four more bolts were required for attaching the cap-plate of the column to another casting above, these could be each 4 in. long, weighing 3½ lbs.; they would have hexagonal nuts, weighing, at 1¼ lb. per pair, 2½ lbs.; and square heads, weighing, at 1⅓ lbs. per pair, 2⅔ lbs.; bringing the total up to 8⅔ lbs., which, at 4d. per lb., would involve an additional cost of 2s. 11d.

NESTS OF ENCLOSED PIGEON-HOLES.

BY C. E. MAES.

DOORS AND REVOLVING SHUTTERS—NEST WITH TWO DOORS—VARIOUS MODES OF HANGING DOORS—DOOR FOR WRITING PURPOSES—SMALL NEST—CONSTRUCTION AND FITTING OF SHUTTER—GROOVES—SHUTTER WOOD—VARIOUS BANDINGS—ALTERNATIVE CONSTRUCTION OF SHUTTER—FASTENING THE SLIPS OF SHUTTER—FIXING THE SHUTTER—NEST WITH DOUBLE SHUTTERS OPENING TOWARDS ENDS—DOUBLE BACKS.

I HAD recently the pleasure of directing readers of WORK how to make a simple nest of pigeon-holes for the classification of letters and other papers. The one described was open in front, so that the contents could not be regarded as secure from the prying eyes of curiosity. This in many instances might be undesirable, for there are few of us who have not some correspondence which we wish to keep private, and apparently this fact has occurred to others, for it has been suggested that the article alluded to should have a sequel giving directions for the construction of a nest of pigeon-holes, the contents of which can be secured under lock and key. In the interest of "my masters, the public," who are readers of WORK, I hasten to comply with what appears a reasonable request, and must, in order to avoid going over the same ground twice, refer those who want information about making the pigeon-holes themselves to pages 103 and 104 of this volume of WORK. The remarks in the present article will be confined to such alterations as may be necessary in connection with the construction and arrangement of doors and shutter fronts.

As shutter or revolving fronts entail a good deal of extra work, it may be well to suggest, for the benefit of those who either have not the time or the desire to take more trouble than is necessary, that a plain hinged door or doors may be used instead of the revolving front, and a few directions regarding the doors and their general arrangement may not be amiss. As this article, however, principally deals with the other method of closing, much space cannot be devoted to the subject of doors, which I may take for granted the reader knows how to make. Detailed directions for their construction may therefore be regarded as unnecessary, and a few remarks in connection with their adjustment to the nest must suffice.

Doors may be added to the nest of holes, made exactly as previously described, by fastening the hinges to the front edges; but this would, at the best, be a somewhat clumsy arrangement compared with the alternative mode of hingeing the doors within the ends, so that the fronts of the doors are on the same level as, or, better still, a trifle back from, the edges of the ends, top and bottom. In order that they may be so, it is only necessary to have the partitions and shelves shallower from back to front than the outer casing—to at least the extent of the thickness of the door framing, which may be about ¾ in. On the left-hand door a bolt will have to be fitted, shooting into either the top or bottom of the case, or, if preferred, two bolts shooting into both may be used. On the right-hand door a "cupboard" lock with bolt shooting to the left will be fixed. The nest of pigeon-holes so made will resemble Fig. 1, which, it will be observed, shows no superfluous ornamentation in the way of mouldings, beadings, etc. These can be added according to the taste and skill of the maker, but, it will be noted, do not enhance the value of the nest so far as mere utility is concerned in the smallest degree.

For a small nest possibly one door may be preferable to two, but this the intending maker must decide for himself. It may, however, be suggested that in a long, low nest such as that described in the previous article, if one door is preferred, it will be better to hinge it at the top or bottom rather than at the end. If hinged at the top, a stay of some kind will be advisable to keep it open when the contents are being got at. This arrangement, however, will be more awkward generally than if the door is hinged at the bottom. In this case the door remains open by its own weight, and, if not allowed to hang down, forms a convenient table on which to sort or look over any of the contents of the holes. It will no doubt occur to many that the lid in this position may very easily be used as a writing table, in which case, of course, the panel and framing must be flush on the inside, and will be pleasanter if lined with cloth or leather. To prevent the lid, or, as we may now call it, the table, falling further than required, a joint stay, obtainable at any cabinet brass shop, may be used, or a simple chain or cord fastened to the inside of the lid and inside the ends.

Many of those who intend to use the inside of the lid for writing purposes may think that if part of the space occupied by the pigeon-holes were devoted to stationery—such as note-paper, envelopes, ink, pens, etc.—it would be an improvement. If they do not quite see their way to effecting this, perhaps Fig. 2, which shows the nest with the lid down and part of the interior arranged as suggested, may be useful to them. They will also notice that this illustration gives an idea by which the article may easily have a more ornamental appearance given to it. In fact, the plain nest of pigeon-holes has become a sightly piece of furniture, which, if carefully made, would not be out of place in any library, and is worthy of being made in better wood than pine, which, however, will do very well for the shelves and partitions.

Now let us turn to the construction of a nest with shutter or revolving fronts. I daresay it is well enough known that in this form of enclosing the contents, doors opening in the ordinary way are not used—if they can be called doors at all; they slide, and, in order to turn corners, they are flexible. They are formed of narrow strips of wood, fastened close together on a canvas or other suitable backing, and slide in grooves prepared for them. Before, however, giving directions for the construction of the shutters, it will be well to take the opportunity of describing a smaller form of a nest of pigeon-holes, and one which will probably be at least as useful as the larger one for ordinary domestic use.

As will be seen from the illustration, Fig. 3, it is rather higher than wide, and is divided into sixteen holes, in four rows of four. The extra height is not only that the shape of each hole may be more sightly and convenient than if square, but is owing to the fact of there being what may be called two tops to the case—one of them the outer one, and the other immediately above the pigeon-holes. Between these two tops is a vacant space of some three inches, to hold the shutter when it is raised, as it is shown to be partly in the illustration last referred to.

A suitable size for such a small nest of pigeon-holes may be named as about 1 ft. 8 in. high, 1 ft. 4 in. wide, and of, say, 10 in. in depth, from back to front, outside measurements. Of course, these may be varied to almost any extent to suit particular purposes, and the only point in connection with them to which it may be necessary to call attention is the depth from back to front *inside*. As the pigeon-holes must be set back to allow of the shutter working in front of them, see that they are deep enough to hold any papers intended for them—in other words, the shutter should clear the papers.

As may readily be imagined, the shutter slides in grooves in the sides or ends of the case, so that, in setting out these, both the thickness of the wood forming the sliding front and the width of the groove will have to be considered with regard to each other. For a small or ordinary sized nest, such as has been referred to, ordinary ¼ in. stuff will be amply thick enough for the front, although, as even the veriest tyro will know, it will be considerably less than ¼ in. thick when smoothed and worked down. If it is only ⅛ in. thick, then it will hardly be too thin, though there is no object in making it so slight. Whatever the thickness, the groove should be a trifle wider, so that the shutter

will move easily and freely in it, though not too loosely. As it may, from lack of tools or other reasons, not be convenient to make the grooves just the right width, as will be seen later on, the shutters themselves may be adapted to fit in slightly narrower grooves. At present we may assume that these can be made exactly of the required width. I must now refer to Fig. 4, which represents the inside of right-hand end of the case. These ends, by the way, may as well be of ¾ in. stuff, for if thinner there may be a difficulty in making the grooves deep enough to give sufficient bearing for the shutter. Along the front edge cut a rabbet the width of the thickness of the shutter, and about half the thickness of the end in depth. The rabbet, it will be seen, merges itself into a groove between the two tops, and, in order that the shutter may work freely, the groove follows a circular line instead of turning sharply. The length of the groove may be determined by actual measurement, but it will be as well in the first place to make it excessive, and stop up the excess after the shutter has been fitted. The bottom and sides of the groove should be cut as cleanly as possible, in order that no obstacle may be presented to the free action of the shutter, which, when all is fitted up, should run as smoothly and easily as a well-made drawer. To ensure this, careful construction and adjustment are necessary. Both ends, of course, are made exactly alike.

The shutter itself is composed of narrow strips of wood, in length just sufficient to reach from the bottom of one groove to the same in the other. It may, therefore, be well to suggest that the case should be fitted together, if only temporarily, before the shutter is made, in order that no unnecessary waste of time may be caused by having to alter this. The width of each piece must be so that it will pass the rounded corners without jamming in them; and to avoid any risk of this, the groove at the corners may be slightly widened if necessary. As will be seen, however, the necessity for this must be determined by the width of the slips of wood forming the shutter. As some idea, it may be said that these pieces should not be more than ¾ in. wide, but they may be as much narrower as desired. The narrower they are naturally the more work there will be in connection with them. As a happy medium, let it be supposed that ½ in. is the width of each piece. So far as actual utility goes, each strip may be perfectly plain and flat, with square edges; but the appearance of a shutter formed of such pieces would not be so nice as could be desired. The joints between each will be unpleasantly conspicuous, so that to adopt some plan by which we may "break the joint" will be an improvement. The easiest way will be to round off each edge, so that the section of the pieces will be as shown in Fig. 5. Two of these being placed close together, the actual line of the joint is thus hidden more or less completely, so that a shutter formed of several pieces shaped thus presents the appearance of being composed of a series of wide beads. Of course, instead of being rounded, the edges may be simply bevelled, as in Fig. 6; or the pieces may be of any section desired. Thus the shutter may be made to resemble a series of small, half-round beads, as in Fig. 7, where the joints may be noticed as indicated between the various pieces. The shutter might be made up of a number of pieces, each the size of the beadings shown, but to do so would entail an unnecessary amount of work, and no advantage would be gained, unless it may be considered that the trifling saving in the waste space between the outer and inner top, which may be effected by the rounded corners having a sharper curve, is a sufficient one. Appearance and convenience will be equally consulted by having each piece with several beads on it. Those shown in the illustration may be taken as being of reasonable size, but there is no reason why they should be strictly adhered to. Now a few words on the easiest and quickest way of forming such a shutter, and the remarks apply more or less closely to any section that may be preferred. The case being together, cut a board of the required thickness and of any convenient width: it is understood, I presume, that the grain of the wood is to be across the front of the nest, and of such a length that it just fits within the rabbet. See that the edges are truly squared, and proceed to work beads across from one edge to the other, using the "scratch" for the purpose. Those who are acquainted with this useful tool will hardly need to be told that after having run as many beads as the cutter will admit of, say, two or three, it is only necessary to remove the iron further in the stock to cut beads over the whole surface of the wood. Those to whom the tool is an unfamiliar one may be referred, with advantage, to the article entitled "The Scratch or Beading Router," in page 101 (No. 7), Vol. I., of WORK, where they will find all needful explanation how to make and how to use this useful appliance. After the beads have all been worked, pieces of appropriate width can easily be cut off with a fine saw without any appreciable detriment to the beads between which it cuts. If no fine saw is available, then leave a slight space when setting the iron between each two or three beads, so that the saw kerf, by removing this excess, will allow each piece to be fitted closely together. If preferred, the pieces may be cut before the beadings are formed, but this will probably be found more troublesome and tedious than the way suggested.

Another way yet may be more convenient, though, for reasons which need not be stated, it may not be so easy for those who have had little or no experience in cabinet-making. In reference to the width of the wood, which it was said should be cut to fit in the rabbets, it may be requisite to mention that if these pieces are of great width comparatively—say, more than five or six inches—they will not be easily manageable with the scratch. Now, instead of having three or four of such pieces, suppose that we have a piece much longer, and perhaps only three or four inches wide; let the beads be run on to it for its entire length, and then cut pieces from it which will just fit in the rabbets, and we get a similar result to that already alluded to. So far as workmanlike proceeding is concerned, there is little or nothing to choose between this and the first method. It must just depend on the ideas of the workman, and the material available, which one he selects. It will easily be inferred, from what has been said, that other beadings or arrangements than those named may be chosen—such as those illustrated in Figs. 8, 9, and 10, which are given not by any means as implying that no others are available, but as suggestions which may be useful. The extent to which the mouldings of each slip may be varied is practically unlimited, and the worker can hardly go wrong with them if he is careful to have the joint sunk between two members, and not on a flat or projecting surface. The pieces being prepared, the next thing will be to fasten them together. Were this to be done by gluing the edges to each other, the door would be rigid, and for the present purpose useless. They must, therefore, be glued on to a flexible backing of canvas, calico, or some similar suitable material. Perhaps nothing is better than the ordinary "Hessian" canvas used by upholsterers, but those who have not got any need not take much trouble to procure it if something else is handier. Glue alone may be used as the adhesive medium, but a mixture of it and good strong flour paste may be regarded as preferable. The canvas may cover the whole of the back of the shutter, though it will be better to leave the portion which fits in the groove bare, or it may be in strips from top to bottom. All that is needed is that the pieces should be, as it were, hinged to each other. However close together they are—and the closer the better—they will not prevent the shutter bending in the required direction—viz., backwards—when it is turning the corners in the waste space. If, as is very possible, some glue has got between the pieces, be careful to remove it before it has set and firmly stuck them together. There will be no difficulty in doing this by bending the shutter backwards at each joint, and if this is done the additional advantage of rendering the shutter more flexible than it otherwise would be will be gained.

It may reasonably be supposed that a lock is to be fastened to the shutter; and, so far, no provision has been made for doing so, for the thin stuff is not sufficient hold for one. In addition to the narrow slips, therefore, a larger one, both in width and thickness, sufficient, in fact, in both respects for a lock to be let into it, must be placed for the bottom one of the shutter. As this piece will only work up and down in the rabbet or straight part of the groove, and will not have to be worked round the corners, it may be of any reasonable width, and, preferably, it should be plain instead of beaded. Some may wonder how a piece of the thickness proposed can work in the groove. I cannot tell them how to perform an impossibility; but this need not be attempted, as it is only necessary to reduce the thickness of the ends of this bottom piece sufficiently for them to fit within the grooves. For various reasons it will be better to have the extra thickness at the back of the door—*i.e.*, the front of this piece should be flush with the remainder of the front of the shutter. This, of course, can easily be managed by removing whatever wood may be necessary from the back only. I suppose it is not necessary to do more than hint that the lock may as well be got, or at any rate its size be decided on, before this bottom piece can accurately be determined. It will certainly be better to adapt the size of the wood to that of the lock than the reverse.

After the glue is dry, a trial of the shutter may be made, in order to see if it fits and runs well. The top strip should be high enough to enter the rounded groove while the bottom one is in its normal position, so that when all is finished the front will be quite closed. If care has been taken, there should be no difficulty in working the shutter backwards, or, as may perhaps rather be said, upwards, so that it runs within the groove easily and without catching anywhere. When it has been opened till the bottom of the lowest slip is on a level with, or a little below, the inner top, the remainder of the groove, if any, may be filled up by gluing a piece of wood in it, to act as a stop; for, of course, the shutter will never have to be pushed further than the position named. Now, should the wood of the shutter be too thick to fit easily

within the grooves, just bevel it off till it is sufficiently thin to do. If much has to be removed, do so from the back; but if only a little, it may be done from either back or front. Possibly a little rubbing down with glass-paper may be sufficient.

Up till now the spaces which the shutter slides in in front can hardly be called grooves, as they are merely rabbets, and the door hangs in them curtainwise, so that it can be lifted forwards, instead of merely sliding up and down. To make grooves of them, or rather, to enclose the sides of the shutter, shutter, a couple of knobs fastened to the bottom piece will be found a convenience.

We may now proceed to apply the principles so fully explained of shutter construction to a nest of pigeon-holes such as we started with, so that when finished it will be like Fig. 11. As readers will remember, it was oblong in shape, considerably so, there having been three rows of nine holes each. Without saying that there might not be a fall-down front, like that described for a smaller nest, such a construction would, to say the least, be inconvenient, and therefore unusual. Instead am wrong in this supposition, I shall be happy to explain anything which may not be quite clear in "Shop" to any inquirer who may meet with a difficulty which he cannot surmount. At the same time, I must ask him to remember that "Shop" is rather overcrowded than otherwise, and not to write for a solution of any difficulty which a little consideration on his part, or experiment, either in working or drawing, might have removed. If he will read the directions for making and fitting a fall-down front, and then imagine that a nest with a double door,

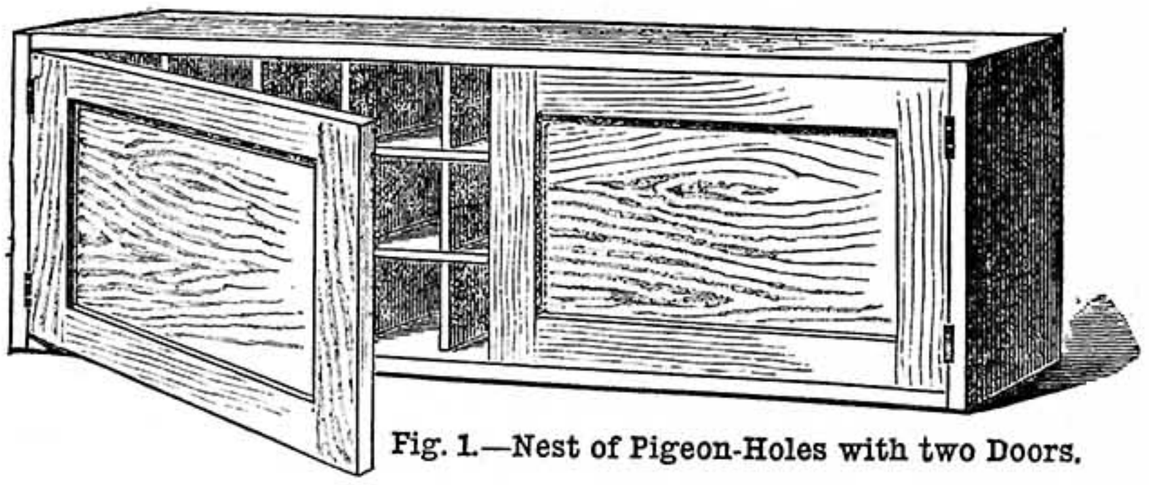


Fig. 1.—Nest of Pigeon-Holes with two Doors.

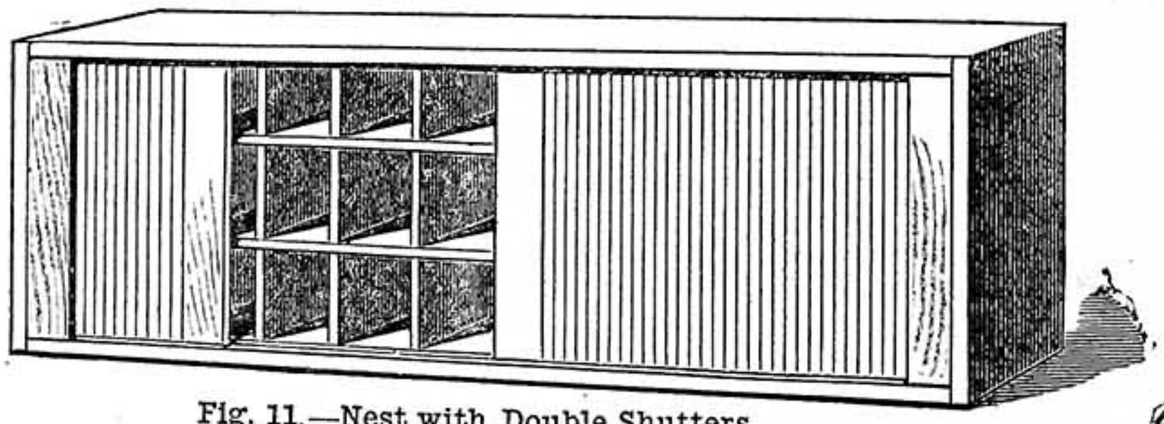


Fig. 11.—Nest with Double Shutters.

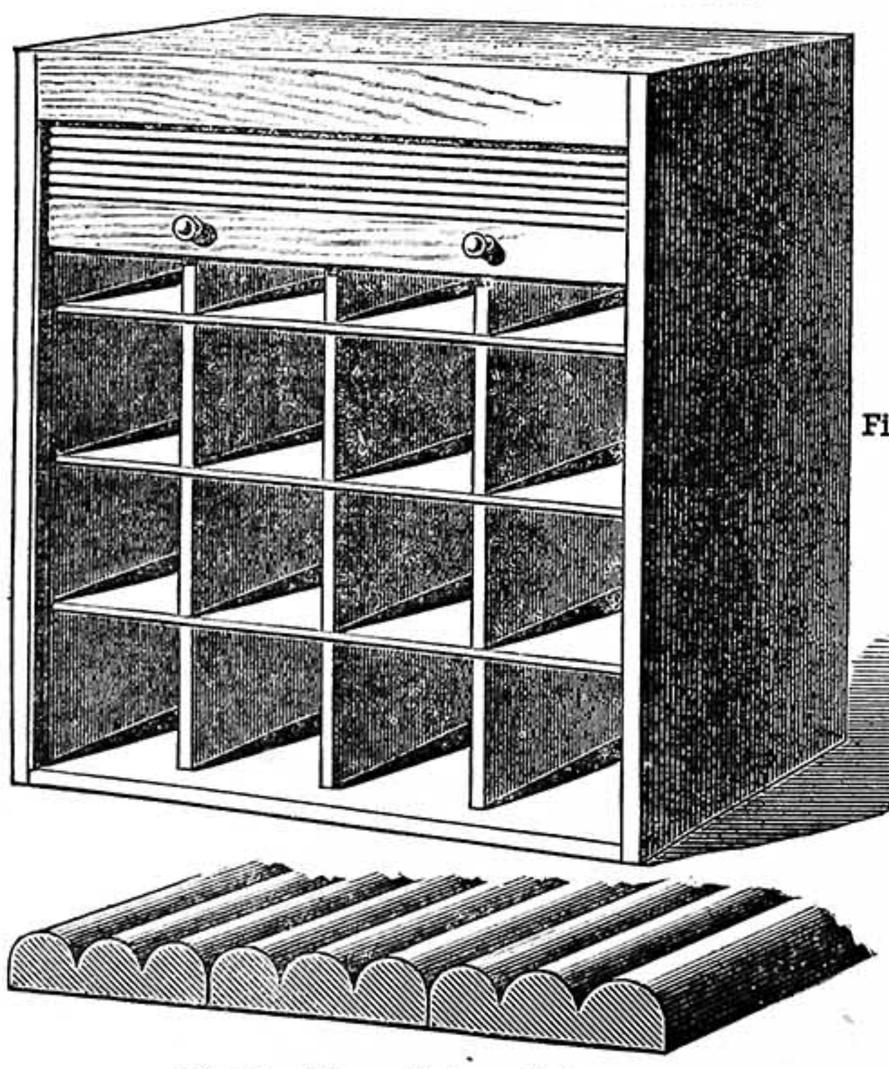


Fig. 7.—Three Strips all Beaded.

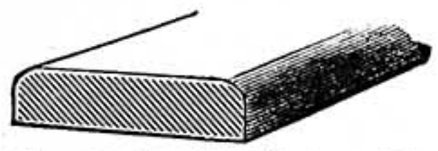


Fig. 5.—Shutter Strip with Round Edge.

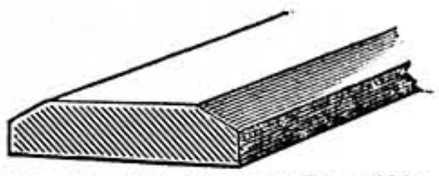


Fig. 6.—Shutter Strip with Bevelled Edge.

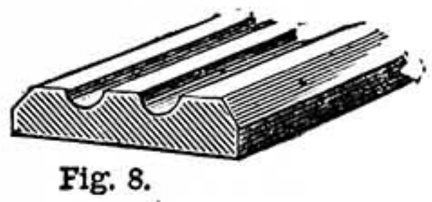


Fig. 8.

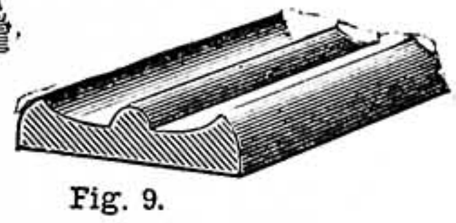


Fig. 9.

Fig. 10.

Figs. 8, 9, 10.—Alternative Forms for Strips.

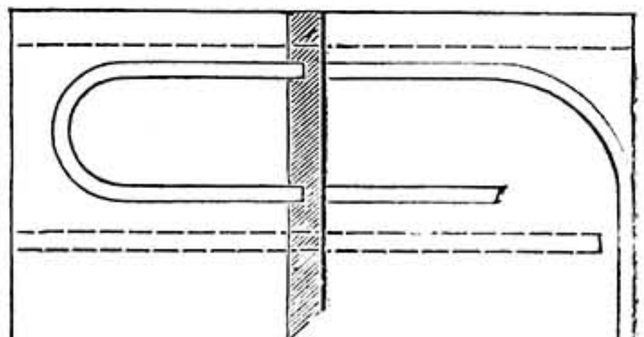


Fig. 4.—End of Nest showing Groove and Rebate on Front Edge. Dotted Lines show Position of Shelves.

Fig. 3.—Nest with Revolving Shutter.

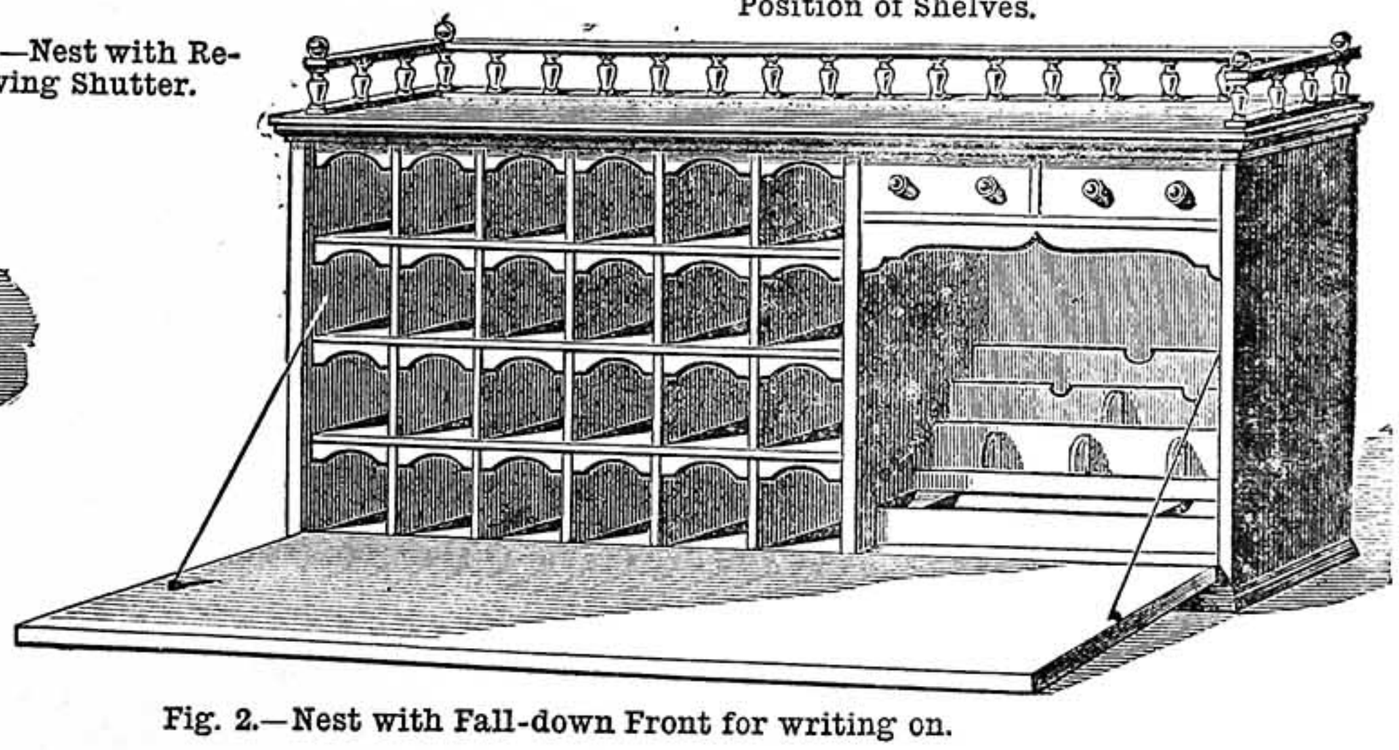


Fig. 2.—Nest with Fall-down Front for writing on.

glue thin slips of wood on the front edges. Provided these slips overlap the sides of the shutter, their width is not important, but it may as well correspond approximately with the thickness of the ends. The shutter being in its place before these pieces are glued on, is now securely fastened, so that it can only move up or down. To bring up the edge of the bottom flush with the ends, a similar piece must now be glued on to it. The same must be done at the top, but the piece there must be of a suitable width; and it may no doubt occur to many that a piece of moulding may be planted on it and carried round the ends. In order to raise and lower the of one shutter sliding up and down, it will be better to make two, opening sideways from the centre. In this case no double top will be wanted, as the shutters will turn into the ends, each of which, therefore, must be made double. The rabbets must be on the edges of the top and bottom, and the grooves will naturally be in the same pieces. Is it necessary to say anything more about this construction? Surely not, for those who have not got a sufficient amount of common sense to see what is required, if they have read all that has been said, could hardly undertake to make a nest with double doors even with full directions. Still, if I sliding sideways, is merely a double-ended one with what was the top for one end, I do not think any mistake can be made.

To prevent the doors when locked from being pushed on one side, and so allowing of access to any of the holes being obtained, and to prevent either door being drawn too far, a stop should be placed at the centre in the rabbeted groove. This can easily be managed by cutting a small corner out of the doors, just where they come in contact with the stop.

With a few general remarks this article must be brought to a close, for the principles of folding-shutter making have been

sufficiently explained to enable almost anyone to do what is requisite, provided he has the manual skill necessary. Instead of the shutters when opened being folded entirely by the ends and top, they may simply pass through the space and in behind. In this case naturally two backs will have to be made, so that the labour involved in making the nest is increased. When the height or length of the nest is great in proportion to the depth from back to front, it will be plain that this form of construction is better than the former, and may be the only one possible.

The amateur will rarely have occasion to make a very large shutter-front, but with the professional cabinet-maker the case may be different. It may, therefore, be well to suggest for his benefit that when the shutters are heavy and open sideways it is sometimes advisable for them to run on rollers. The fitting in of these he will, however, require no special directions about; but should anyone want to know, it is, as I have said, only necessary to ask for a reply in "Shop." Anyone doing so will please note that the dimensions of the case and thickness of the wood used *must* be given.

MEANS, MODES, AND METHODS.

A Novel Use for Clothes Pegs.

The ordinary wooden clothes pegs, which are sold at one penny per dozen, of all hardware merchants, can be turned to a variety of uses by the worker in wood.

The peg, if cut off above the point in which it divides in two, forms a very respectable substitute for a turned pillar in the manufacture of "antique" furniture, especially if it receives a few thread-cuts in the lathe, but this is not at all necessary. I have used dozens of them without any further addition than a rub of sand-paper,

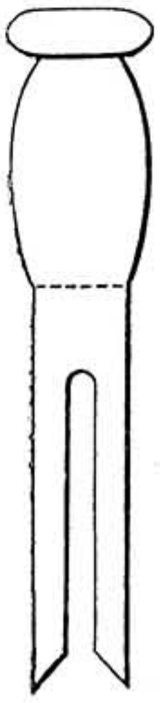


Fig. 1.—Turned Wooden Clothes Peg.

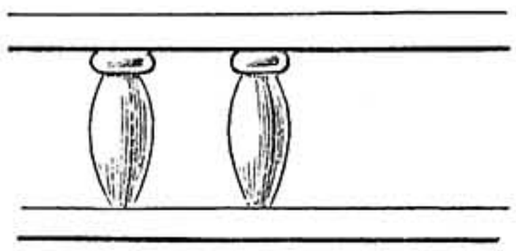


Fig. 2.—Clothes Peg as Spindle.

Fig. 3.—Clothes Peg as Handle to Fan.

and my friends have been greatly surprised when told of their origin.

Another use to which they can be effectively put is in the manufacture of handles for the numerous class of substantial "fans," such as have spaces for portraits cut in their surfaces.

All that is necessary is to cut off the two sloping tips of the peg and insert the leaf of the fan between the two sides, securing it in position with either a nail, screw, or glue, and painting or gilding it, according to taste.

A form of the wooden clothes peg as made by the turner is shown in Fig. 1; in Fig. 2 an example is given of its use as a spindle; and in Fig. 3, how it may be used as the handle of a fan. Without doubt the suggestions here given will prove useful, and many will be led to adopt them.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

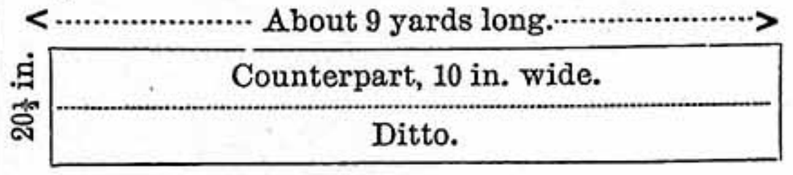
40.—Engel's New Transfer Graining Sheets.

There are many amateur workmen—yes, and many professional workmen, too—who can use the brush and contents of the paint-pot well enough as far as plain work goes, but who would be utterly nonplussed if they attempted to take a turn with the graining comb and cloth, or sought to do anything in imitation of natural wood or marble. The work of the amateur is confined to painting-in unbroken stretches of various colours, or to staining and varnishing; and the painter who does mere ordinary work is obliged, through lack of natural ability or mechanical aid, to leave the imitation of woods and marbles to men who make this kind of work their speciality. But, thanks to Mr. George Engel, 18, Castle Street, Falcon Square, London, E.C., who manufactures and supplies the "New Transfer Graining Sheets," and who, I presume, is the patentee, natural ability for graining and marbling is put into the shade altogether, and mechanical aid is brought within the reach of anyone and everyone who may care to avail themselves of it. Having seen the sheets and the results produced, I am longing to have a turn at the work, but the pleasure must be deferred until leisure permits, and when that will be, "goodness only knows," as the ladies mildly put it, for with me, as time turns on, toil seems to increase instead of lessen, and I don't care to follow the fashion and go on strike—just yet awhile, at all events, although there is no knowing what the force of example may bring about in the future. However, I can readily endorse Mr. Engel's statement that these sheets are a boon to decorators and painters, that graining by hand is—in many cases—completely surpassed, and that the working is remarkable for its simplicity, rapid, and economical, and the results obtained as effective, certainly, as many of the best attempts at imitation that we see, and often as telling as natural wood or marble.

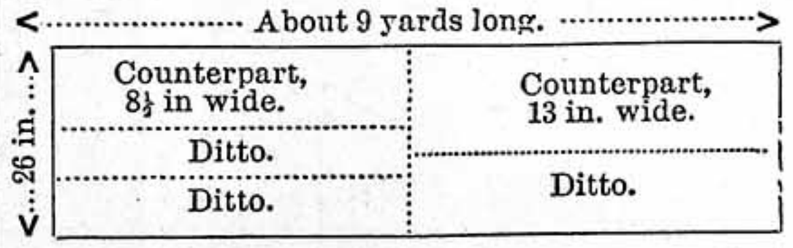
That these assertions are such as will hold water will fully appear when it is explained that, after the fashion of the coloured transfers which are sold for the amusement of children, these sheets are so prepared that the grains of oak, walnut, maple, ash, mahogany, rosewood, etc., as well as every kind of marble grain, can be transferred on to surfaces painted in the ordinary way by simply wetting the back of the paper. Everybody knows—or I presume that it is so—that when a surface is to be grained it is first painted over with the proper colour that forms, so to speak, the groundwork of the graining. This being done, the following are the instructions for graining with the transfer paper:—"Cut the transfer paper a little larger than the size required, place face downwards on a dry, clean table, and wet the back well and evenly with a *half wet* sponge, taking care not to let the water stand on the back of the paper. Let the paper soak for another three or four minutes until the grain print begins to get glossy. Wet the surface to be grained with a sponge, distribute the water well by rubbing over with a stiff hair brush, that the surface becomes *evenly damped, but not too wet*, place the transfer paper face downwards on the moistened surface without creases, rub the back well with the same brush, take off the paper, and go over the grained surface with a softener *at once, while wet.* The paper will make four or five *good* impressions while wet." The operator is advised to use stale beer instead of water for wetting the paper, or a mixture of half stale beer and half size water. After the grain is perfectly dry, it should be smoothed over with glass-paper, and boiled linseed oil applied by means of a rag. When dry, the graining and the surface to which it has been applied should be varnished in the usual way.

"The work is simple enough, anyhow," many a reader of Work will doubtless say. Yes, that is so: and it is as rapid as it is simple, for, after a little practice, inexperienced hands—that is to say, hands who cannot grain or marble in the usual way—can use the sheets, and by their instrumentality do the work twenty times quicker than any artist can grain by hand. As to its effectiveness, it need only be stated that the manufacturer says the designs are impressed on the paper from natural woods and marbles, and that the work thus done is scarcely distinguishable from the wood or marble it represents.

As to its cheapness, and therefore economy in the use of the sheets, it may be said that the cost of material used in graining a square yard may be estimated at being about a penny, and that the application of the paper to such a surface takes only five minutes. The manufacturer says that "to grain and varnish a yard takes only five minutes," but as this involves a duplex operation, I am not prepared to go with him as far as this. As to the form in which it is given to the public, it should be said that the "Patent Transfer" is sold in rolls of about 9 yards long in two widths —20½ inches and 26 inches. The 20½ inch wide rolls are made in one continuous grain of 20½ inches, and also in two counterparts, each of 10 inches wide, as shown in the accompanying diagram:—



The 26 inch rolls are made in one continuous grain of 26 inches, and also in two counterparts, each 13 inches wide, or in three counterparts of 8½ inches wide, as shown in the diagram given herewith:—



From these sketches it will be apparent that the paper can be cut to the required sizes for any kind of work, with little or no waste. The varieties of wood grains usually supplied are—*Oak*, light, medium, and antique; *Walnut*, American and soot; *Ash*, in two varieties; *Maple*, bird's-eye, silver, grey, and yellow; *Cherrywood*, *Rosewood*, and *Mahogany*. Marble grains are made in all varieties in rolls of the same length and width as those of imitations of woods. There are over a hundred designs from which a selection may be made, and the maker will send a sample roll 20½ inches wide for 2s. 6d., post free. Otherwise, the 20½ inch rolls are supplied at 2s. per roll, net, and 26 inch rolls at 2s. 6d., postage per roll in each case being 3d. extra. For orders of at least fifty rolls discount is allowed to the trade.

I have dwelt at length on the Patent Transfer Papers, because I regard them as being among the best things to which I have been privileged to call attention for some time, for any amateur who is so inclined may grain a chest of drawers or the woodwork in his house with the utmost ease; and the professional painter in any country town or village who has not ventured hitherto to attempt the higher branches of his art, may do so now without any fear of failure or of causing disappointment through want of success in any imitation which he has undertaken to effect, whether in wood or marble. I mentioned them to a jobbing carpenter the other day, who does a good deal in house-repairing, and he jumped at the notion like a trout at an attractive-looking fly on a dull day. It showed him, in fact, how he might venture on painting of a more ambitious character than that which he has hitherto attempted.

The Editor.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

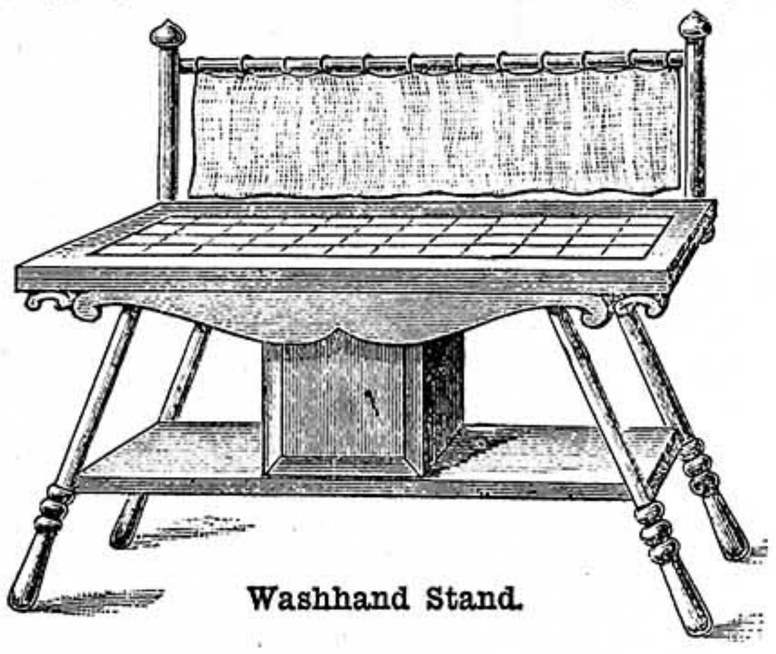
Drawing One's own Specification for Patent Office.—ANOTHER INVENTOR writes:—"I have been very much pleased in reading the article by Inventor, entitled, 'Some Words to Would-be Patentees,' in No. 116 of WORK; and having obtained a protection for an idea of mine (thanks to WORK), I thought that perhaps a few lines from me would be of help and encouragement to others who, like myself, wish to protect an invention, but do not care to pay the sums generally charged by patent agents. So having worked out my idea, I was about to go and see an agent, in whose hands I intended to place the job; but on calling on a friend who had done a little business through the Patent Office, he advised me not to, but to get the forms and do it myself. So after getting home, I referred to my Index of WORK, Vol. I., and read the articles by C. C. C. and others. After getting the forms from the post-office, I started to fill them in and draw out the specification, which I found easy after the advice given in WORK, and then posted them off to the Patent Office. The next few days brought me letters from firms at London, Paris, Brussels, and Berlin, all offering to render me assistance on very reasonable terms; and one kind friend wrote to inform me that my specification was informal, and not so full as it ought to be, and that I should have it returned in due course from the Patent Office: that if I would place the matter in his hands, he would make what alteration was necessary for 5s. 6d. It is, of course, unnecessary to state that I took no notice of these letters, but waited patiently for my specifications to be returned—which really did take place, as prophesied by my friend. In the course of a few weeks I received my specifications back for amendment, which amendment consisted of the alteration of three words, and which alteration my friend offered to do for 5s. 6d.—very reasonable indeed! After altering, I again sent them up to the Patent Office, and in a few weeks received a form saying my application was granted. I really think, with Inventor, that the officials at the Patent Office do all in their power to assist inventors. But I think I am mainly indebted to the advice and help given in WORK, which so materially assisted me in filling up form and specification; and as I have WORK from its first number to this week's—the two first volumes bound and indexed—I shall prize it more so because of the help it has rendered me on this particular occasion."

Rate of Circular Saws.—CHOPSTICK writes:—"I cannot resist the temptation to reply to Woodworker's letter on the above subject (see WORK, No. 116, page 187), as the arguments he makes use of are not only very misleading, but altogether absurd. In the first place, can he find any joiner who will cut a 3 in. plank with the rip saw? if he can, I think they must be fond of work in his neighbourhood; and secondly, I will defy any man to cut wood of that thickness at the rate of speed he mentions for any length of time. And now a word in favour of the machine which he condemns so strongly. I have, on a home-made machine, cut 3 in. deal, and the man who turned the wheel preferred doing it that way to cutting it with a rip saw, and it was certainly cut in half the time and in a better manner. For cutting thinner stuff, and also for rabeting, grooving, etc., the advantages are far greater; and I will even go so far as to declare that no shop should be without one of these useful tools, as they will repay their cost double and treble. If the cost is too much for an iron one, a wooden one does equally as well, only the bearings should be well fitted, and the fly-wheel should be heavy. Then, with a labourer to turn, you will soon find out the fallacy of Woodworker's arguments."

Fillers in French Polishing.—W. D. (*Newington Butts*) writes:—"I know of no better filler than what is given by David Denning (see page 166, Vol. III.). All new work will sweat in time, as the oil used in polishing will find its way through the film of lac. I use Russian tallow mixed with plaster of Paris, with rose-pink for walnut and mahogany. A good filler-in for oak and ash is water and methylated spirits (used as water), and plaster of Paris, coloured with rose-pink, for brown oak, and yellow ochre for light oak or ash. Pumice-powder can only be used with advantage by experienced French polishers. A preliminary rub with polish before filling-in will not only keep the grain smooth, but stop the sweating to a great extent, as there would be a foundation of polish. 'Filling-in' is the term used by French polishers."

Holes in Girder Webs.—A. B. (*Salford*) writes:—"Mr. J. W. Harland, in an article on 'Constructive Strength in Metal Work,' in WORK of 30th May last, speaking of cast-iron girders, remarks that 'it is very bad construction to drill holes in the web itself,' and proceeds to give his reasons for this statement. He also says that 'the nearer the hole to either flange the less dangerous it becomes.' I think it necessary to point out to your readers that *Mr. Harland's view of this question is entirely opposed to the teaching of all the leading engineering lecturers of the day, as well as to practical experience.* The one place, above all others, where it is possible to drill a hole in a girder with the least damage to the strength of the girder is in the neutral axis, or the line passing along the web where the compression of one flange gradually fades away, if I may use the expression, into the tension of the other flange. Any good work on mechanical engineering will explain this. At present I will refer your readers to Professor Perry's 'Practical Mechanics' (Cassell & Co.), where, in Chap. XI., they will find the statement that the neutral axis passes through the centre of gravity of the section of the beam; and what is more to the point, to Sir John Anderson's work on the 'Strength of Materials,' Chap. XII., where they will find the words: 'The neutral line is the part where holes for fixing other parts connected with the girder may be made with impunity.'"

Washhand Stand.—A. H. W. (*Newcastle-on-Tyne*) writes:—"I venture to send you a rough sketch of a washhand stand in the suite, the sight



Washhand Stand.

of which made me hope that in some of your numbers I should see a paper on simple artistic furniture. In my sketch I have not reproduced enough elegance, I know."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Electric Belt.—A. C. (*Burnley*).—Commencing at the left-hand end of your belt, as sketched, let the top disc be of copper, the next below it of zinc, the lower disc of copper, the lowest disc on the next row of zinc, the middle disc of copper, and the top one of zinc. This will form one battery of three pairs of elements in that section of the belt. Connect them in pairs, copper to zinc. Treat each section of the belt in the same manner. You will then have four batteries in one belt. You may adopt another arrangement, if you choose to do so, by having each alternate row of discs made of copper, and the other of zinc. I see no advantage, however, in your arrangement over that recommended to G. F. R. (*Woolwich*), p. 827, Vol. II. The current generated in your belt (if any) will be of low tension, owing to absence of outside discs. I should advise you to sew pieces of magnetised crinoline steel in the belt instead of the copper and zinc discs. Let the steel strips lie in the same direction as the whalebone, and cover them with flannel. A magnetic belt of this kind will do you as much good as an electric belt.—G. E. B.

Magnet, etc.—A. G. (*Sheffield*).—(1) The diameter of the magnet is not a point to cause much thought; it may be anything. I think I mentioned it in my article; if not, I have unconsciously omitted it: I meant to have stated ⅜ in. Get it that diameter, and you will be all right. (2) Where can the magnets, etc., be obtained? At the address given on the circular or any other electrical supply store. (3) I cannot give instructions here for making a transmitter like the one in the cut on the circular, for two reasons; the first being I do not know what kind of a transmitter the cut represents; the second being that it would require too much space—more than is available in this column. I have already given instructions in "Shop" for making a very reliable form of transmitter; and an article is in the Editor's hands, giving details of a switchboard and method of connecting up bells, etc. All the instruments can be joined up with one line wire. (4) About No. 28 wire will do for the line—about 1d. per yard.—W. D.

Blocking Cards.—ANXIOUS.—There are several methods by which cards can be blocked with Dutch metal. You ask for a dry process. The most simple is the following: Get some common resin and pound it very fine; tie it up in a cotton rag, and dust it over the part where you want the metal to stick. Now, having heated your blocking press and stamp, take up a leaf of the metal and lay it over the stamp; place your card in the press, and block in the usual manner. It will be easier if you can take out the plate of the press readily upon which the stamp is fastened, and replace again. There are small presses for this class of work made and sold now by most makers. After the blocking has been done, the superfluous metal is dusted off with a piece of rag. Let your stamp be very hot.—G. C.

Faulty Dynamo.—T. S. (*Hull*).—You have not described the castings of the dynamo, so I am left to guess what it is. I suppose it to be of the Gramme type, but even now do not know its size, so can only guess this also. Readers asking advice respecting dynamos, must give full dimensions of the magnets and armature, and also describe the type of machine. I think you have enough wire on the fields and armature to give current equal to 30 c.-p., but not enough to send current through a lamp requiring 30 volts. Your lamp is a 30 volt 8 c.-p. lamp. If you connect the three lamps in one circuit in parallel, the resistance of the circuit will be reduced, and you will be able to light the three lamps where you have failed to light one. If you have room on the armature for a few more turns of wire, put them on, and balance this with about 200 yards more of wire on the fields. When amateurs find their machines going wrong, they should first write to the vendor of the machine or the maker of the castings.—G. E. B.

Bicycle Building.—J. S. (*Wimborne*).—A series of articles on Bicycle Building is running through the present volume (III.) of WORK.

Seal Gas Engine.—NEMAM.—The address of the maker of this engine is: J. Seal, 67, Carthew Road, Hammersmith, London, W.

Incubator.—CHICK.—A description of an incubator appeared in "Shop," page 654, No. 41, Vol. I.; also an article on same in No. 89, Vol. II. On page 762, No. 99, Vol. II., you will find some remarks of mine on the subject; and on page 75, No. 109, Vol. III., some further remarks, with a description of a regulator. Get these four numbers from your bookseller, or the publishers will send them post free for five stamps. In the course of a week or two an article describing a "hot-air" incubator will be in the Editor's hands, and will doubtless appear in good time for you to prepare a machine for use next season. It is too late to think of commencing one for work this season.—LEGHORN.

Incubator.—G. H. (*Hackney*).—See reply to CHICK above.—LEGHORN.

Mending and Stopping Terra-Cotta.—R. L. (*Ruabon*).—If R. L. has not tried shellac dissolved in spirit for mending, he should do so. For stopping cracks or faults, we presume that fresh, quick-setting plaster of Paris, with some of the terra-cotta pounded to dust to give the required colour, would suffice.—M. M.

Duplex Telegraphing.—R. B. (*Edinburgh*).—This subject must wait for an article. It would occupy too much space in "Shop."

Purfling Gauge.—H. McC. (*Kilmarnock*).—Refer to the advertisement columns in the last few numbers of WORK, and you will find the address you require.—B.

Xylonite.—TEVOT, A FRETWORKER, and others.—The address of the Xylonite Company is: The British Xylonite Company, Limited, 124, High Street, Homerton, E.

Carpenters' Society.—J. R. (*Kilmallock*).—We know of no branch to recommend.

Toy Cylinder.—CYLINDER.—This is a question that can only be answered by describing the entire mechanism of a steam engine, for which there is not space in "Shop." If you will read the article now appearing on a Quarter Horse-Power Engine, you will obtain a complete answer to your query.—J.

Drills.—W. G. (*No Address*).—These drills will do very well if tempered a little harder. They go through brass, but I find they lose their edges on iron. But I do not see any advantage in using common umbrella ribs, when you can buy steel wire suitable for the purpose, wire that will temper better.—J.

Galvanising, Enamelling, etc.—HOLLY READER.—It is not within the province of amateurs to enamel iron plates. It requires special and expensive plant and material.—R. A.

Green Stain for Holly.—P. O. C. (*Cork*).—This is usually made by dissolving verdigris in hot vinegar till the required shade is procured, or the crystals of verdigris in hot water. But the aniline dyes, as sold in packets or tubes for a few pence at most druggists and drysaltery stores, will be found to meet all requirements, if only a small quantity—say a quart—is needed, especially if a little vinegar is added as directed. It will be well to bear in mind that the hotter these stains are applied, the more deeply will they strike in.—LIFEBOAT.

Accordion Reeds.—H. C. (*Whetstone*).—As accordion reeds cannot be sharpened more than quarter tone, a new reed should certainly be fitted to the instrument. The method of tuning these is as follows:—To sharpen, file the reed thinner at the free or vibrating point; to flatten, thin it near the fixed end.—G

Enamelled Paper Letters.—A. J. R. (*Norwich*).—Beit's patent enamelled adhesive waterproof advertising paper letters and figures, in all colours and sizes, can be had from makers, 17, Arthur Street, New Oxford Street, W.C.—H. L. B.

Case Hardening.—C. T. & Co. (*London, E.C.*).—No process of "hardening" will make iron or steel rust proof; highly polishing it has a tendency to prevent rusting. If the goods are only required to be rust proof during transit, heat them a dull-red heat, and let them cool in the air, when a thin film of the insoluble black oxide is formed. If the goods are now brushed over with oil, they would travel ten times round the world without rusting. Galvanising iron or steel goods is about the best protection, and is largely being adopted for all exposed ironwork. I have often wondered why exposed ironwork is not more enamelled, as all kinds of shades and tints could be used, even transparent enamel. Such would last for ever, never want painting, and every shower would wash it clean.—J. H.

Bookshelf for Bedroom.—J. C. (*Halifax*).—A convenient form of bookshelf for the bedroom is the one herewith drawn. Its advantages are that it can be removed in an instant, and replaced elsewhere without leaving or causing any disfiguration to the wall. It is much to be preferred, for the use required of it, to a shelf supported by brackets; and, as is apparent, requires less labour in its construction. Again, the side strings form a kind of preventive against the books slipping off endways. A very small nail, driven into the wall at each end so as to allow its head to press against the end edge of the shelf, will retain it in its proper position; for without such an aid it would slip to the right or to the left, according to which side happened at the time to bear the most weight. You can see from Fig. 2 that it is merely a board supported by strings whose knots are underneath it, slung round large-headed nails.—J. S.

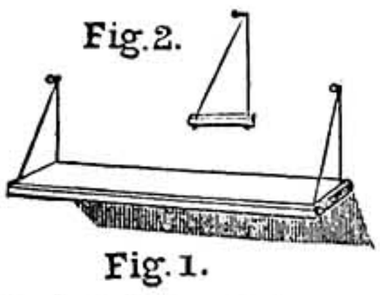
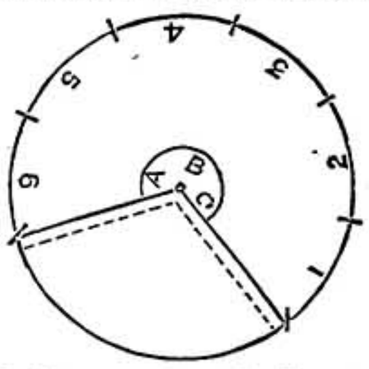


Fig. 1.

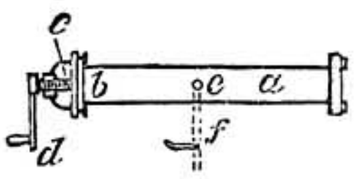
Bookshelf for Bedroom. Fig. 1.—Bookshelf in Perspective. Fig. 2.—End of Shelf in Elevation.

Paraffin Bottles.—BLACKSMITH.—You do not state what size bottle you want to make, so I here give you the sizes to cut the bodies of 1 qt., 2 qt., 4 qt., and 8 qt. I expect these will be as many as you will require: 1 qt., 13½ in. by 4¾ in.; 2 qt., 19½ in. by 6¾ in.; 4 qt., two pieces 11 in. by 7½ in.; 8 qt., two pieces 13¾ in. by 9¾ in. To cut out the tops, set your compasses at a radius of three-fourths of the diameter of the body, measuring from out to out of edge, and draw a circle; then set the compasses to *half* the diameter of the body measured as before. Set off six parts round the circle previously described, and draw lines to the centre; see sketch, which will explain it clearly. The dotted line shows allowance for seam about ¼ in. each side. This is a rough method of getting at the pattern for the tops, but it gives fairly correct results.—R. A.



Pattern of Bottle Top—A B C, Small Circle for Neck of Bottle.

Bending Tonkin Bamboos.—J. W. P. (*Leeds*).—Probably our correspondent has no very complete apparatus for bending his bamboos, or we see no reason why he should have found difficulties with his tonkins. They bend readily from such a steamer as that shown in the annexed diagram. In this *a* is the receptacle for bamboo, etc.; *b* is its lid, which has an elastic washer, and is opened and closed by the screw *c*, worked by the winch *d*; *e* is a supply pipe from an engine boiler, which has a stop-cock at *f*. The strips of wood are placed in the receptacle, the lid screwed close, and the steam turned on. Ten minutes more or less may be required, according to its rigidity, to soften the wood sufficiently; the tonkins will need full time or perhaps super-heated steam. When the wood is softened, the steam is turned off; one man works the winch, and opens the lid just so far as to allow a second man to take out a strip, which he bends and wedges in place *instantly*, and so on till the whole are bent. But quickness of action is essential; a minute's delay may chill the wood and cause a breakage. Steam is mostly used to bend, dry heat to straighten.—S. W.



Steamer for Bamboo.

Opaque Objects.—F. B. (*Taunton*).—F. B. asks for a "liquid to make a dull black background for mounting microscope objects." The following will, I am sure, answer all F. B.'s requirements: Brunswick black mixed with a small quantity of a solution of indiarubber or mineral naphtha. This latter will prevent cracking. Place the slide on the turn-table, and make a central disc, having first warmed the glass. Give it two or three applications, if need be. Let the last coat be dry before another is applied. By repeating the operation on the edge, form the cell to the desired depth. Some mounters cement a disc of cardboard or black paper on the underside of the slide, in addition to the black cement, but if carefully done, I do not think there will be any need.—O. B.

Ladies' Work-Table: Joints for Legs.—J. J. A. (*Wandsworth Common*).—Connect columns to the middle and bottom boards of my Ladies' Work-Table and Escritoire (No. 56, Vol. II.) after some such manner as I hereafter illustrate. By preference, adopt my suggestions concerning middle board in Fig. 17, page 53, in the same number. You can then dowel it by means of three or more pins to the column blocks. For sufficient details dealing with dowelling, read my article, "Combined Music-Stand," etc. (No. 35, Vol. I.). An alternative

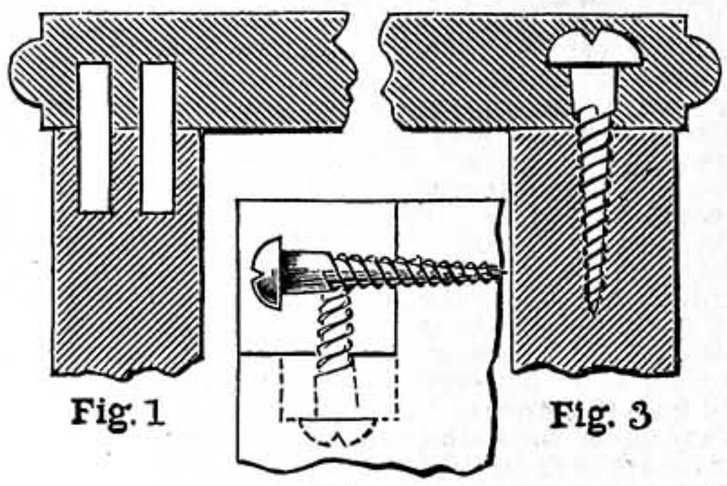


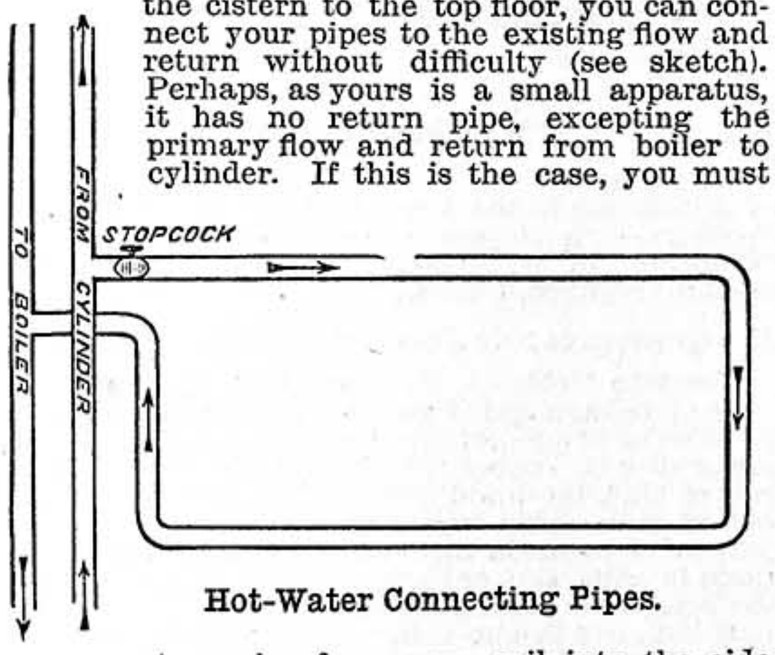
Fig. 1 Fig. 3

Fig. 2

Screws for Leg Joints.

method will be to secure both by utilising strong stout screws, as in section (Fig. 3). If, however, you desire to build the article exactly as it is shown in my drawings as complete, you must join the middle board in the same way that I am about to describe the junction of the bottom board with the pillars. You may have two stout dowel pins to one inner side of the column block, and have a stout screw passing through the remaining inner side; or drive a screw in as in Fig. 2, and insert a separate and rather small square of wood against the block, touching the underside of the bottom board, and there screw and glue it to all adjacent parts. Afterwards fill up all screw holes.—J. S.

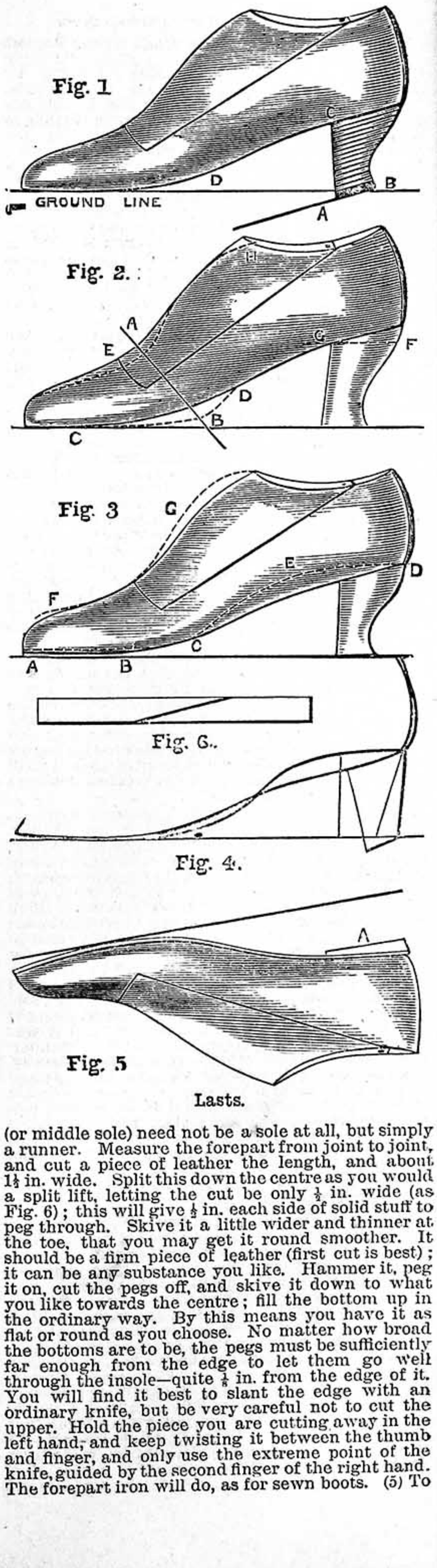
Hot-Water Service.—RELAW.—If you remove the cistern to the top floor, you can connect your pipes to the existing flow and return without difficulty (see sketch). Perhaps, as yours is a small apparatus, it has no return pipe, excepting the primary flow and return from boiler to cylinder. If this is the case, you must



Hot-Water Connecting Pipes.

carry a return pipe from your coil into the side of the cylinder near the bottom, or you may carry it into the primary return from cylinder to boiler.—T. W.

Lasts.—S. T. (*No Address*).—(1) Evidently the last is out of range for the height of heel you wish to make. If it is not much, it can be counteracted by feathering the insole, and sewing close and full, as explained in answer to A. B. (see page 796, No. 101, Vol. II., of WORK); but the last being very bad, it must be remedied by altering its construction. The plain lines describing the lasts in Figs. 1, 2, and 3, are all the same; and it will be seen by Fig. 1 that it is somewhat dead, or flat in the waist. Well, by building a high heel, one lift above the other, without reducing them at the breast, will throw the heel out of range, as shown at A, B, and C (Fig. 1); and if they are reduced at the breast to give a better range, when the boot is worn, and the pressure of the foot put on D, it will press it down to the ground line, and again throw it out of range. To fit the last to prevent this there are two ways, and if the last fits anyone, and has still to have low heels made on them, it will be best to alter them in a way that they may quickly be brought back to their original shape with little trouble. For this, first take the measure of the last round the joint at A B (Fig. 2), and then peg a piece of leather—that has been wetted—on the bottom of the last from C to D and right across; skive the leather down, as shown by the dotted line at B, tapering to nothing at C and D, but making it more gradual from B to C than from B to D. Then rasp the wood away, as shown by the dotted line at A E, until it measures the same as when it was first measured. Then peg another piece of leather on the heel. Let it be quite thick at F, and tapered to nil at G; a little can be taken off the wood at H the other way, and if they are to be used for high heels only, it will be the best. Rasp a piece off the bottom at the toe, from A to B (Fig. 3), as shown by the dotted line, and also from C to D, taking it away most at E, and then this deficiency can be made up at F and G with leather. The plans of the two bottoms are given in Fig. 4, to contrast the pitches of the same heel on the two different lasts. (2) Yes; the insole of pegged boots should be made broad, and thinned down at the edge, but it should be left its original substance where the pegs are going. To bring the range right for pegged work (as it cannot be feathered and sewn full to set it right), it must have a wedge-lift pegged to the insole, before lasting (as A, Fig. 5). This is done to have the same effect as produced by altering the last, only that it is left in the boot where it is not seen. It need not be a whole lift—a split lift will do—but it must be thick at A. But I would advise you to alter the last as much for one as the other. (3) A split lift is put in, in building the heel of sewn boots, to level the seat (to receive the whole lifts), which would otherwise be round in the centre, and necessitate cutting the centre away, and making a part of the boot weak that should be most solid. (4) If you are making light pegged work, the "slip" sole



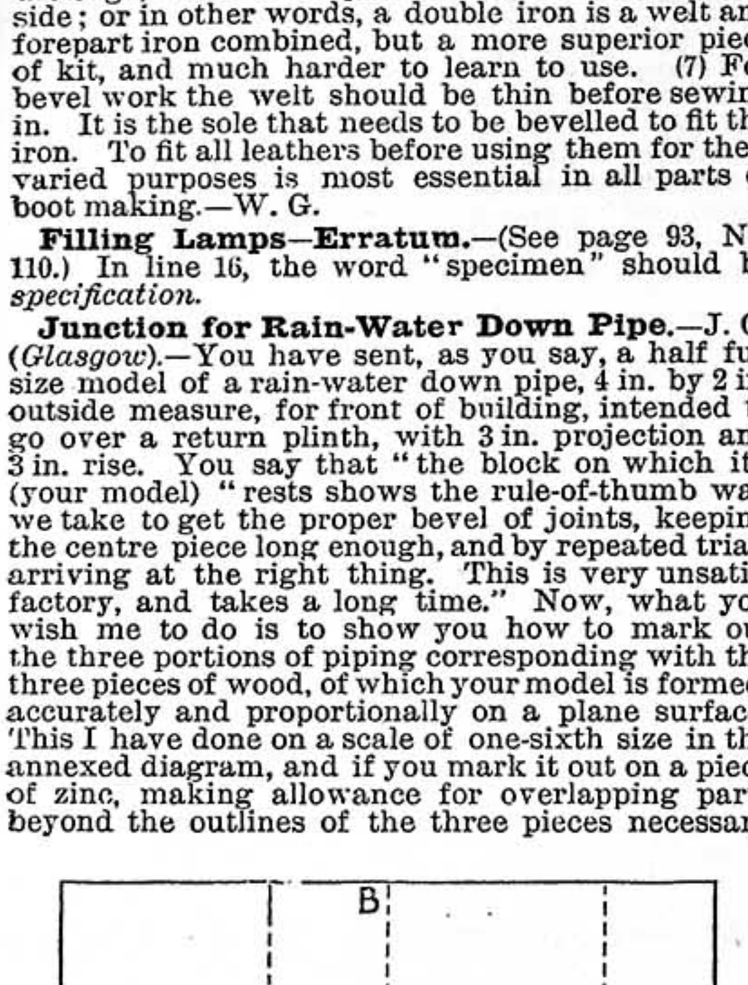
Lasts.

(or middle sole) need not be a sole at all, but simply a runner. Measure the forepart from joint to joint, and cut a piece of leather the length, and about 1½ in. wide. Split this down the centre as you would a split lift, letting the cut be only ½ in. wide (as Fig. 6); this will give ½ in. each side of solid stuff to peg through. Skive it a little wider and thinner at the toe, that you may get it round smoother. It should be a firm piece of leather (first cut is best); it can be any substance you like. Hammer it, peg it on, cut the pegs off, and skive it down to what you like towards the centre; fill the bottom up in the ordinary way. By this means you have it as flat or round as you choose. No matter how broad the bottoms are to be, the pegs must be sufficiently far enough from the edge to let them go well through the insole—quite ⅛ in. from the edge of it. You will find it best to slant the edge with an ordinary knife, but be very careful not to cut the upper. Hold the piece you are cutting away in the left hand, and keep twisting it between the thumb and finger, and only use the extreme point of the knife, guided by the second finger of the right hand. The forepart iron will do, as for sewn boots. (5) To

hole the soles of pumps, use a sewing awl—the one you are going to sew with, or one a shade larger will do. (6) A welt iron is used for the welt side of the edge, while a forepart iron is used for the sole side; or in other words, a double iron is a welt and forepart iron combined, but a more superior piece of kit, and much harder to learn to use. (7) For bevel work the welt should be thin before sewing in. It is the sole that needs to be bevelled to fit the iron. To fit all leathers before using them for their varied purposes is most essential in all parts of boot making.—W. G.

Filling Lamps—Erratum.—(See page 93, No. 110.) In line 16, the word "specimen" should be *specification*.

Junction for Rain-Water Down Pipe.—J. G. (*Glasgow*).—You have sent, as you say, a half full size model of a rain-water down pipe, 4 in. by 2 in. outside measure, for front of building, intended to go over a return plinth, with 3 in. projection and 3 in. rise. You say that "the block on which it" (your model) "rests shows the rule-of-thumb way we take to get the proper bevel of joints, keeping the centre piece long enough, and by repeated trials arriving at the right thing. This is very unsatisfactory, and takes a long time." Now, what you wish me to do is to show you how to mark out the three portions of piping corresponding with the three pieces of wood, of which your model is formed, accurately and proportionally on a plane surface. This I have done on a scale of one-sixth size in the annexed diagram, and if you mark it out on a piece of zinc, making allowance for overlapping parts beyond the outlines of the three pieces necessary



Pattern on Flat Surface for Rain-Water Down Pipe to go over Return Plinth, with 3 in. Projection and 3 in. Rise.

for joining them together, which you, as a practical workman, know how to do, you will arrive at once at the desired result, without any rule-of-thumb trials. First of all, set out on the zinc a central line, and in it take a point C; through this point draw two straight lines, D E, F G, making the angles D C A, B C E, and A C G, F C B respectively, with the line A B. These four angles are angles of 70°, and must be set out in relation to A B with a protractor. Figures in pencil on your model, verified by actual measurement, show that these angles are angles of 70°, but you and others must understand that this angle is not a fixed quantity, but will vary according to the dimensions of the rise and projection over which the pipe may have to pass. Having drawn the straight lines D E and F G through C at the proper inclination to A B, the rest is easy. Draw a straight line from F to E at right angles to A B, and cutting A B in H, and from H set out along this line H K = 2 in., K E = 4 in., and H L = 4 in., L F = 2 in. Through the points K E, L F, draw, parallel to A B, the vertical lines shown in the diagram as passing through these points respectively. The dotted lines through the points L, H, K, show where the zinc is to be bent to form the parts of the pipe. Set out from C, along C B, C M = about 5¼ in., and through M draw M P, parallel to C E, and M O parallel to C F. Again, through P draw P N, parallel to C F or M O, and through O draw O N, parallel to C E or M P. Cut out the shaded triangles D C F and G C E, and the shaded equal-sided part O M P N, called in mathematics a rhomb, or rhombus. When the three parts that are left are joined up, and their edges brought into contact, you will find that you have arrived at your junction for rain-water down pipe without much trouble, and no needless waste. Possibly, to some people, this may seem a very long-winded reply, but all plumbers and zinc-workers will know that it is nothing of the sort. Moreover, it is no use whatever to attempt to give a reply on a matter of this kind to a practical man who has been accustomed to work by rule-of-thumb, unless you put it in such a way as will make it perfectly clear to his comprehension. I have said nothing about the horizontal lines passing through A and B. They merely define the extent of the upper and lower pieces in accordance with your model, but practical men will recognise that the limits which they represent may be determined at any length from C and N as may be necessary.—ED.

Cracked Saw.—R. W. A. (*London, W.C.*).—The little inequality in the wood should not have caused your accident. You ask whether it is best to break the saw off or to braze it. To break or to try to break it off would be folly, and to braze it you would have to cut the piece straight across first, and then have both ends filed to a bevel before brazing, which would not only reduce the length of the saw, but would spoil the temper for a certain distance, and perhaps render it useless. You did not say how far the crack is from the point. You say it is 2 in.; therefore I judge it to be 2 in. *in length;* but if the crack is not more than 2 in. from the point, and your saw is 28 in. long, should you cut the piece off it will be then the length of an ordinary hand-saw; and if the crack is a little further up from the point, my advice is to cut it off and file the point square, and you will find it useful for some work, and in its place lay out a shilling or two more than you gave for it, and get a good saw. Now, there is a right and a wrong way in cutting off a piece from a saw. If you are not careful, you may ruin your saw. First get a wide chisel in the form of Fig. 1, and grind to an obtuse angle (as shown in Fig. 2), and temper it very hard. Then place the saw on the anvil, with the handle towards you, and the point from you. Take the chisel (holding it straight across the saw, with the head slightly inclined towards you), and strike a blow with a fairly heavy hammer; then move the chisel, and strike another blow, not too heavy, just making a mark with the chisel across the plate. Then go over the same spot again, striking the chisel pretty smartly, taking care to hold the head of chisel a little towards you, or you may get a serious crack or flaw in the plate, and your saw will be of no use. After the piece is off, file the end, and it will not be perceived whether the saw has been cut.—A. R.

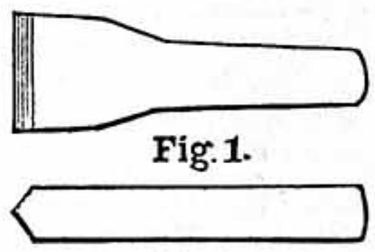
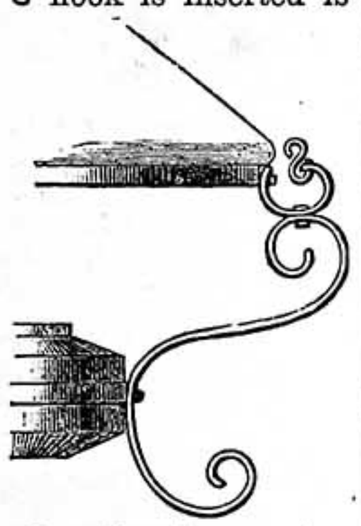


Fig. 1.

Fig 2.

Fig. 1.—Wide Chisel.
Fig. 2.—Ground Angle.

Paraffin Lamps.—W. W. (*Eastbourne*).—Half in. by ⅛ in. flat wire is strong enough. Have you seen the lamps on p. 696, Vol. II., of WORK? They are made to hang or stand. As sketched, your lamps would be top-heavy. If you do not want to use castings as shown on p. 696, why not shape the side supports as I show in the figure herewith? The piece into which the S hook is inserted is riveted or screwed to the rest of the support, and is thus much more secure than you show in your sketch, in which, apparently, you intend soldering a piece on. Do not put curves of too small a radius, or the metal may break, notwithstanding you may have softened it by heating. To bend it, use, if possible, the tool used by smiths for a similar purpose, which is shaped something like a tuning fork, with short, thick, round prongs sufficiently wide apart to admit the metal to be bent. It is fixed in the hole in the anvil or in the vice, or held in the hand and used as a wrench. If you cannot obtain it or a makeshift substitute, bend the wire over anything round by means of a mallet. Whatever is used to bend, it must not have sharp edges where the metal touches, or nice curves will be impossible. You must give up your evident idea of lifting the lamp with one hand. It is too large for that. If you use hard solder there will be no need to hammer-harden the metal afterwards.—THOMASO.



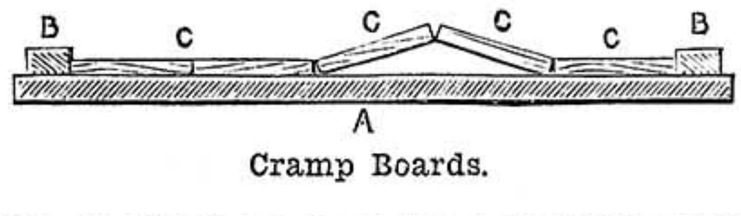
Paraffin Lamp to hang or stand.

Banjo Tailpiece.—G. C. (*Waltham Cross*).—If you wish to make money out of a patent, it must be something in advance of anything at present in use; if not, instead of being in pocket you will be considerably out of pocket by it. Again, if your article is good, and you can see a chance of making some money with it, patent it yourself. Do not take it to someone, and ask them to buy it from you before patenting it.—J. G. W.

Violin Varnish.—W. G. (*Derby*).—The violin must not be stained; the varnish itself should contain the colour. Following the papers on violin making, the subject of violin varnishing will be treated as concisely as possible. I think that anyone requiring only a small quantity of varnish—say, as much as would be required for two or three instruments—would be well advised to buy, rather than make, the varnish. I am at present experimenting with a varnish which is, or will be, in the market, and it gives promise of being successful. As the essential oil of turpentine, which will be the solvent of the gums required for the varnish, does not take up colour in sufficient quantity, it will be necessary to use alcohol as a means of charging the oil with colour. Make a saturated solution of sandal-wood, or any desired colour, and concentrate this solution, by evaporation, to half its original bulk. Mix this concentrated solution with oxidised essential oil of turpentine, and evaporate all the spirit in a water-bath. As alcohol evaporates before reaching the boiling point of water, it will not be necessary for the water to boil. When the little bubbles cease to rise, the spirit will have gone, and the colour will remain in the essential oil. To every ¾ gill of coloured essence, 5½ dr. of mastic tears, 3 dr. of dammar, 5½ dr. of raw linseed oil, and 5½ dr. of roughly-powdered glass; the latter is added to prevent the gums from adhering to the vessel. First put in the mastic, which will take twenty-four or thirty hours to dissolve. Then add the dammar, reduced to powder; this will take about the same length of time. Shake the bottle two or three times a day. Afterwards add the linseed oil; shake a little, and the varnish is made. Let it rest a week or two, and then filter through fine cotton or filter-paper. It must not be used for six or eight months.—B.

Double Bass.—BASSO.—A double bass is only a big fiddle, and the materials and method of making are necessarily the same for both, the dimensions only being different. By all means try your hand at fiddle-making before commencing to make a bass. The work is very heavy, the models very cumbrous; and for one instrument the cost in time and materials would run up to something like £20.—B.

Cramps.—L. M. (*Lee, Kent*).—The best plan for you to adopt is to plane the edges of the boards accurately; neither cramp nor anything else will make bad joints good ones. Obtain a flat board, larger than your work; on the side, close to the edge, fix firmly a strip of wood; lay the prepared wood on the board, close to the strip; mark the width on the board, and fix another strip, say, ⅛ of an inch nearer to the first strip. You can now, by putting down the outer edges of your boards in contact with the fixed strips, force every joint into close contact by pressing on the boards thus:—



Cramp Boards.

When the joints are glued, leave a weight on the boards to prevent the middle rising again. Some precaution is needed to prevent the glue fixing the whole affair together. Some grease or soap will do, but my plan is to lay a strip of paper where each joint will be, and it answers the purpose with little trouble. This mode of gluing is excellent for panels and similar work. L. M. had better get the back numbers in preference to investing in second-hand wooden cramps, as new ones are cheap enough, and there are many hints on cage-making in previous numbers.—B. A. B.

Colours for Cornice.—GRADUATE.—The "peculiarity" of distemper colours in drying much lighter is scarcely a thing peculiar to that process of work. If a dry colour is saturated with any colourless liquid, water or oil, the difference is about the same; with *tempera* work, however, we get back the original colour, because the water evaporates off, whereas the oil remains in the form of a semi-transparent film. Flatting paint would to a certain extent meet the case, but even the action of the turpentine evaporating makes an appreciable difference between the colours in the pot and when dry. As, however, flatting should be used almost as a wash, the previous coating, or ground, as it is termed, has to be coloured with a view to assisting the final colour—opacity cannot be ensured by flatting paint alone. Even pure powdered pigments, when used with water or size, undergo the same change. Body colours, as you term them, are simply finely-ground pigments, having sufficient gum or other binding power already added, to dispense with using glue or size. There is no doubt the tints of alabastine, made by the Church Manufacturing Company, would answer your purpose. Were the Company to find a demand for, say, 2 lb. packages for tinting and gesso-work, they would soon meet it. Write for all particulars to 127, Pomeroy Street, London, S.E.—DECORATOR.

Cleaning a Fox-Skin Carriage Rug.—A. B. (*Nottingham*).—Take newly-made bran, warm it in a pan over the fire—stirring all the time to prevent burning—and having spread the rug as straight and flat as possible on a table, rub the hot bran well into it for some time. When the fur is sufficiently cleaned, shake and brush the bran out. The cleaning will be done most effectually if the lining and stuffing are first removed. Another way is by moistening bran with hot water, and rubbing it into the fur with a piece of clean flannel; then drying the fur with dry bran and a dry, clean flannel.—M. M.

Iron Trade Work.—ONE IN TROUBLE!—I should say: Stick to the fitting. You must allow yourself six or seven years to learn it, instead of two and a half. A good fitter can always be sure of regular and remunerative work. The union will be glad to admit you to membership as soon as you can earn the average wages of the district in which you happen to reside; but not otherwise. It is not

necessary that you should belong to the union in order to obtain a situation.—J.

Galvanising.—J. P. (*Handforth*).—Galvanising is a somewhat similar process to tinning; in fact, the only difference is that the articles are dipped in a bath of molten zinc instead of tin. To prepare them for galvanising, the goods are first "pickled" in a tank of sulphuric, or sulphuric and hydrochloric acids mixed, and diluted with water. To quicken the action of this, it is often heated by steam-pipes. When sufficiently clean, they are dipped in killed spirits of salts, and then dipped in the molten zinc, which is covered with a layer of sal-ammoniac. For small things—such as nails, staples, etc.—a sort of cage must be used to dip them in.—R. A.

Lacquering Brass.—BRASS.—The address you require for lacquers, etc., is the Frederic Crane Chemical Co., 22, Newhall Hill, Birmingham. Charles Harrop, Esq., is the manager.—R. A.

Walnut Stain and French Polish.—W. H. P. (*Birmingham*).—The best French polish for your purpose will be that made by dissolving about 6 oz. of best orange shellac in 1 pint of methylated spirit. A good walnut stain is made as follows: ½ lb. American potash, one pennyworth vandyke brown, one pennyworth nut-galls, a little brown umber, and one gallon of hot water. I strongly advise you not to take your first lessons in polishing on your bookcase; rather try your hand on some plain, flat surface. You will then be enabled to do your bookcase with far more satisfaction to yourself.—LIFEBOAT.

Varnishing.—X. Y. Z.—The loss of brilliancy in the varnish might arise from many different causes. I should not think the fault was in the varnish. You should speak to the traveller about it, and hear what he has to say, if you have not already done so. Sometimes it is in the varnish, it being too new; and, on the other hand, using the bottoms or last of the varnish, in which the driers have settled; by standing, this would be likely to cause the trouble. Then, again, the varnish not being sufficiently hard when the carriage is first used; or standing near a manure heap, when the ammonia from the stables will very soon take the brilliancy off the varnish. In many cases the coachman is in fault in washing the carriage instead of sluicing the mud off *whilst it is wet*. Many will leave it till the morning, when it has dried on; then they take the spoke-brush or sponge, and scrub and scour away to get it off; the consequence is, they flat off all the face of the varnish: then the blame falls on to the painter's shoulders. But we must not entirely blame the coachman, as there are some who are very careful in washing off wet mud. I understand you give the vehicle three coats of colour: first, priming, and second of ground colour. You mix them with boiled oil and turps, and sugar-of-lead for driers—you do not give proportions—then two coats of varnish. If you use boiled oil in the first coat of ground-colour you should not use it in the second; that should be mixed with varnish and turps and linseed oil. Sugar-of-lead driers should be used very sparingly. Here seems the cause of mischief. You will seldom find two painters work alike; they each have a different method of working or colour mixing and painting. I would suggest you try the following method, by which I have always found good results, using Noble's or Hoare's and other makers' varnishes. If it is an old vehicle to be repainted, clean off thoroughly with soda and water, touch in all the bare places with lead colour to keep the wet out while you are rubbing down, then rub all the cracks out with pumice-stone and water in the usual way; then paint with a coat of lead colour. This should be mixed thus:—One-third linseed oil to two of turps, mixed with patent driers —½ lb. to a little lampblack, and 3 lbs. of white lead. "Stop up," face off, and sand-paper down in the usual way. The ground or body colour is made with one-third linseed oil to two of turps, and half the quantity of coach-makers' gold size to that of the oil. Second coat is made with no oil; mix body colour with turps and hard carriage varnish in equal parts. Third is a coat of glaze or varnish colour. Now two coats of varnish are laid on—one flatting varnish, the second finishing. This should be a full coat. Let it stand for three or four days before using the carriage. The under coating, or flatting varnish, should be of the same maker's, as varnish of different makers will not always agree, and the best grade finishing varnish cannot impart its wearing quality to worthless under-coating varnish. Are you quite sure your "filling-up" stuff is made properly, and free from red lead? The sum of my suggestions is: never use boiled oil—it is often made up of the worst of oil and driers, only fit to paint fences with, not carriages. Be sparing of driers, as they are corrosive in their action on oils and varnish. Gold-size contains a considerable amount of driers —*i.e.*, sugar-of-lead, sulphate of copper, etc. Turps is a vegetable drier in its action, and always safe to use when mixed with varnish; it should be done while both are warm, to make them blend thoroughly. Give plenty of time for each coat to dry before applying a second coat. Keep the paint-loft at an even temperature, free from draughts, dust, and damp. Remember, water solidifies the surface of varnish; and by washing off the vehicle when varnished, you ensure a hard, lustrous surface, to stand better the action of mud and manure, and the scrubbings to clean off dry mud.—J. C. K.

Carved Oak Cabinet.—X. L. U. MAY (*Hebden Bridge, Yorkshire*).—I congratulate you on having made so handsome a piece of furniture from an old oak chest. As the name you give seems to me to be a *nom de plume*, I retain your drawing, until I hear from you again.—ED.

Razors.—H. S. (*Oxford*).—If H. S. will refer to Volume II., No. 100, page 782 of "Shop," he will find an article on "How to Set a Razor;" and by reference to Volume III., No. 105, page 7, he will find a short account of "How to Strop a Razor." These two combined will give him, I think, all the information he desires on that subject.—P. B. H.

Electric Signalling.—J. H. (*Leigh*).—Electric signalling is generally performed by the telegraph. You will find a popular account of this in Cassell's "Popular Educator." Electric signals may also be made with electric bells; and a system for doing this, arranged by myself, is clearly explained in Mr. Bottone's book, "Electric Bells and all about Them," post free for 3s. from the author, Mr. Bottone, Wallington, Surrey.—G. E. B.

Corrosive Sublimate.—AMATEUR TINKER (*St. Austell*).—Corrosive sublimate is sometimes sold under the name of chloride of mercury, sometimes under the name of perchloride of mercury, and sometimes as bichloride of mercury. It may be distinguished from the other chloride of mercury by being soluble in water—1 part of corrosive sublimate being soluble in 16 parts of water—and this forms a saturated solution, as mentioned on p. 714, Vol. II., of WORK. If you get 1 oz. of the corrosive sublimate, and dissolve it in 16 oz. of cold water, it will form a saturated solution. The subchloride of mercury (calomel) is not soluble in water. Corrosive sublimate is a virulent poison.—G. E. B.

The Praxinoscope.—A. H. (*Oldham*) thinks that to have the construction of this instrument described would be of interest to the readers of WORK. I could give such a description as he suggests, but I should not be justified in so doing, nor would the readers be justified in working from my description, as M. Reynaud, of Paris, the inventor of the praxinoscope, has patented it in this country. A. H. also asks where pictures for it are to be obtained. He might try the Scientific Toy and General Novelty Co., 14, Cross Street, E.C. Some time since, the shop of Messrs. H. G. Clark & Co., Garrick Street, W.C., was a good place for such matters, but I am under the impression that they are not now at that address.—M. M.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Coal Box.—W. J. D. (*Earlswood*) writes:—"Will H. B. (*Haydon Bridge*) kindly give dimensions for constructing a coal box to hold a sack (2 cwt.) of coals, as shown in his design, No. 109, Vol. III., page 75?"

[As the plan of one has already been given, W. J. D. should be able to construct a box to suit his own requirements. "Shop" space is too valuable to go on duplicating designs.]

Model Electric Lights.—J. H. (*Wolverhampton*) writes:—"Will Mr. Bonney or some reader of WORK kindly tell me where I can obtain the carbon plates for model electric lights, as described in WORK of Nov. 29, 1890; also, if possible, the cost of them?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Turned Balusters.—H. (*London, N.*) writes, in reply to F. E. H. (*Lancaster*) (see page 158, Vol. III.):—"The following dealer will supply T. E. H. with price-list of turned, square, and spiral balusters, etc. Address, H. R. Mace, Ekman's Wharf, 33, Wharf Road, City Road, N."

Petroleum Motors.—M. (*Bishop Auckland*) writes, in reply to CONSTANT READER (see page 142, Vol. III.):—"These are worked by ordinary petroleum, require no attention while in operation, and can be stopped immediately. As compared with gas engines, they require less cleaning, the valves running for months without cleaning or attention. If you apply to Messrs. Priestman Bros., Holderness Foundry, Hull, they will give you all particulars, being the licensees and manufacturers."

Cotton Belting.—J. N. (*York*) writes, in reply to S. A. & Co. (*Stockport*) (see page 158, Vol. III.):—"I have had cotton ropes that run at 56 ft. per minute, and I send him the following recipe: 3 lbs. of tallow, 2½ lbs. black-lead, ¼ lb. beeswax. If a little more grip is required, then add more wax."

Glossy Ticket Ink.—W. E. B. (*Peel Causeway*) writes, in reply to A. H. (*Oldham*) (see page 158, Vol. III.):—"The above-mentioned ink can be obtained from Messrs. Brodie & Middleton, 79, Long Acre, London. Red, 6d. per bottle; black, 6d. per bottle; per parcels post, 4½d. extra on each bottle, or on a bottle of each 6d. in all. This ink writes easily, and dries quickly and glossy."

Fire Balloons.—H. R. JONES (45, *Barking Road, Canning Town, E.*) writes, in sequence to T. S. (see page 134, Vol. III.), that he is one of the largest fire balloon makers, and that he sells balloons to carry fireworks or parachutes.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—THE ARTISTS' ALLIANCE; FRETWORK; PUZZLED; F. W. B. (*Huddersfield*); F. W. J. (*Fulham, S.W.*); J. MCA. (*Glasgow*); LONG READER; INQUIRER; HALF-TONE; J. T. N. (*London, N.*); A NEW SUBSCRIBER; JEAN; J. R. M. (*Peckham*); APPRENTICE; J. G. P. (*Woolwich*); F. S. (*Normanton*); B. A. W. (*Croydon*); J. M. (*Manchester*); J. H. (*Salford*); BANJO SLOGGER; A. R. (*Scorrier*); E. W. (*London, W.C.*); G. B. (*Edinburgh*); R. W. (*Bradford*); SILVERSMITH; T. M. (*Birmingham*); L. S. L. (*No Address*); G. B. (*Walthamstow*); C. P. (*Crowborough*); H. J. M. (*Bristol*); T. T. & SONS (*Cardiff*).

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